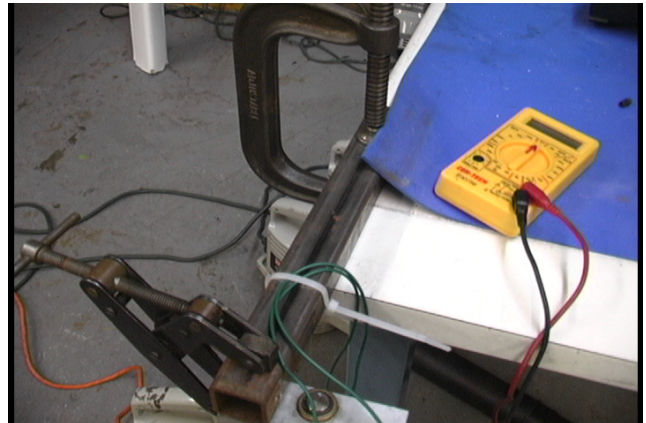
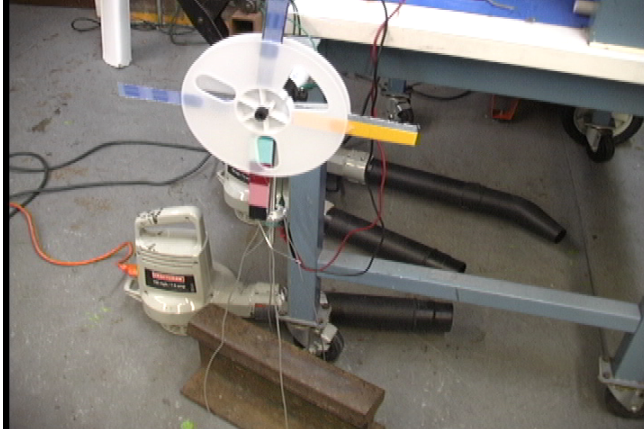
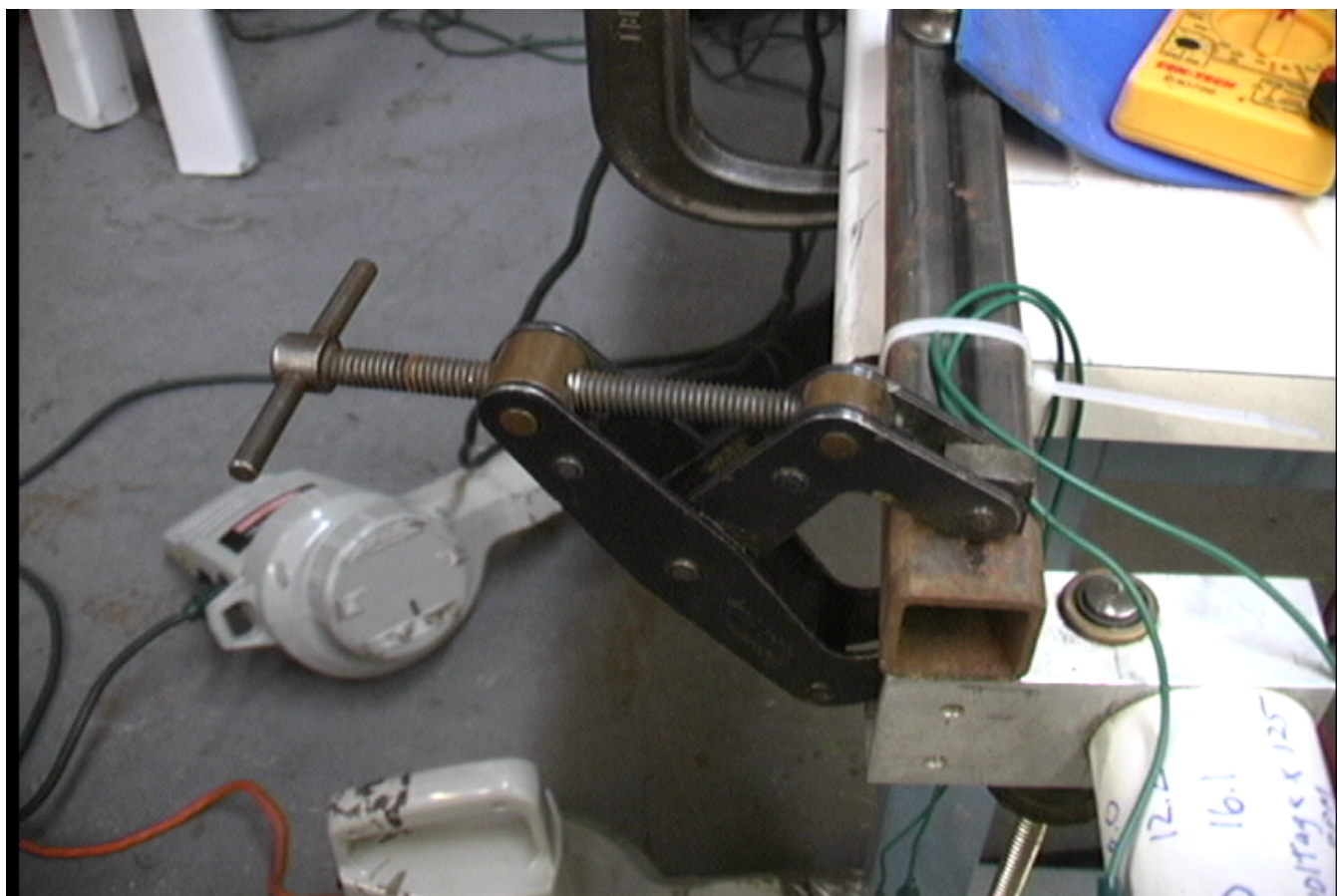
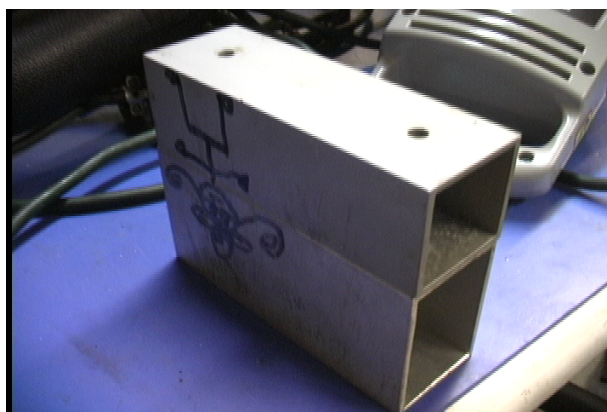
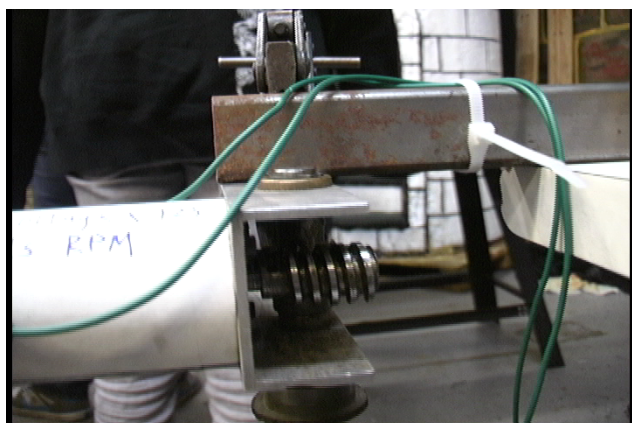
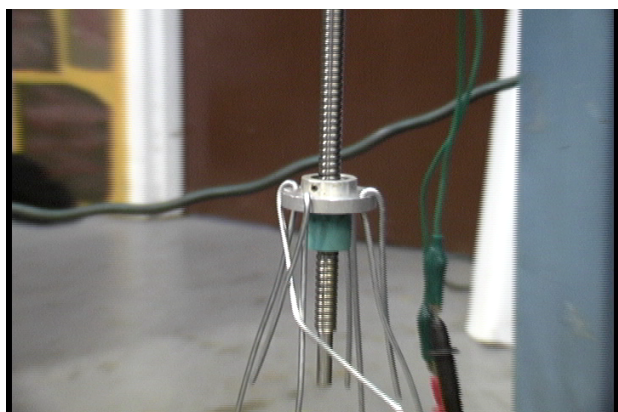


"Windmills" Lesson Summary (2-part Lesson)

Part 1

Testing Station:





Materials:



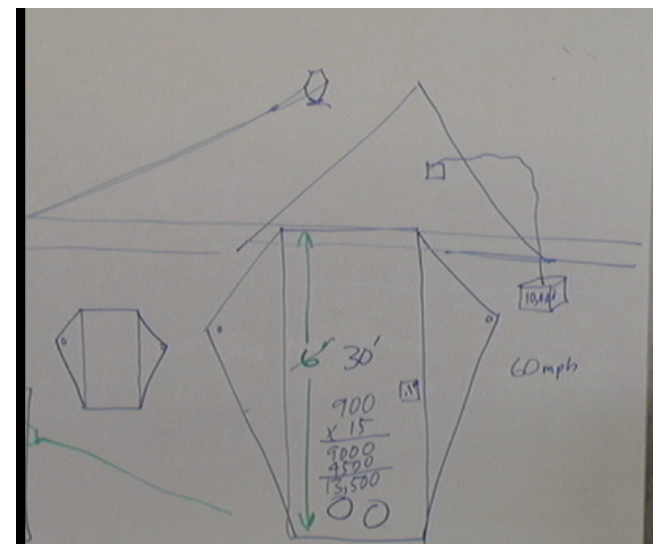
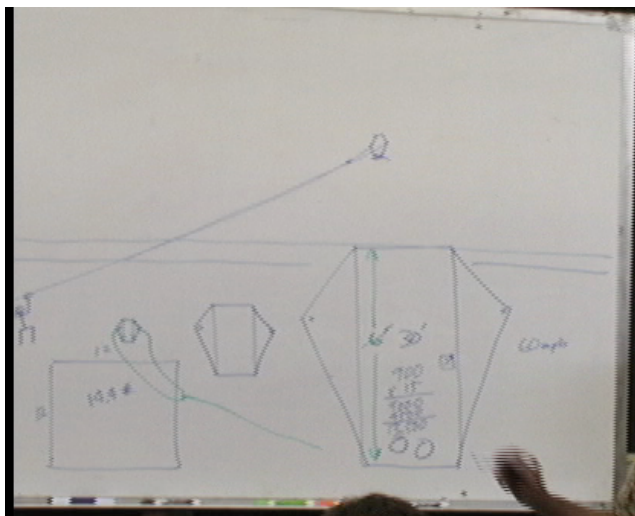
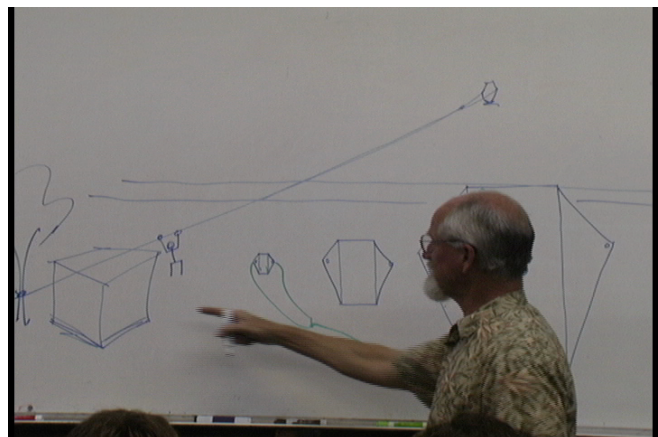
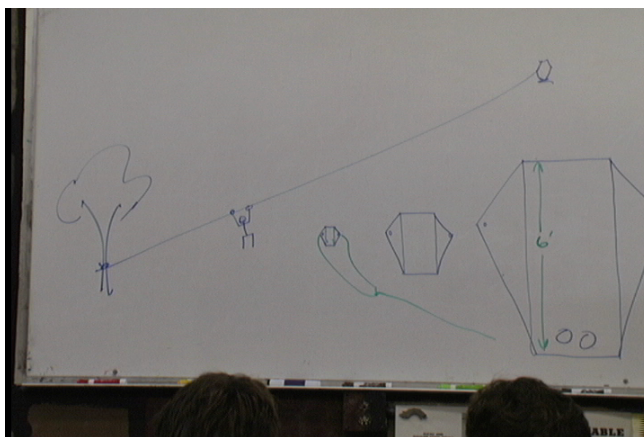
Intro:

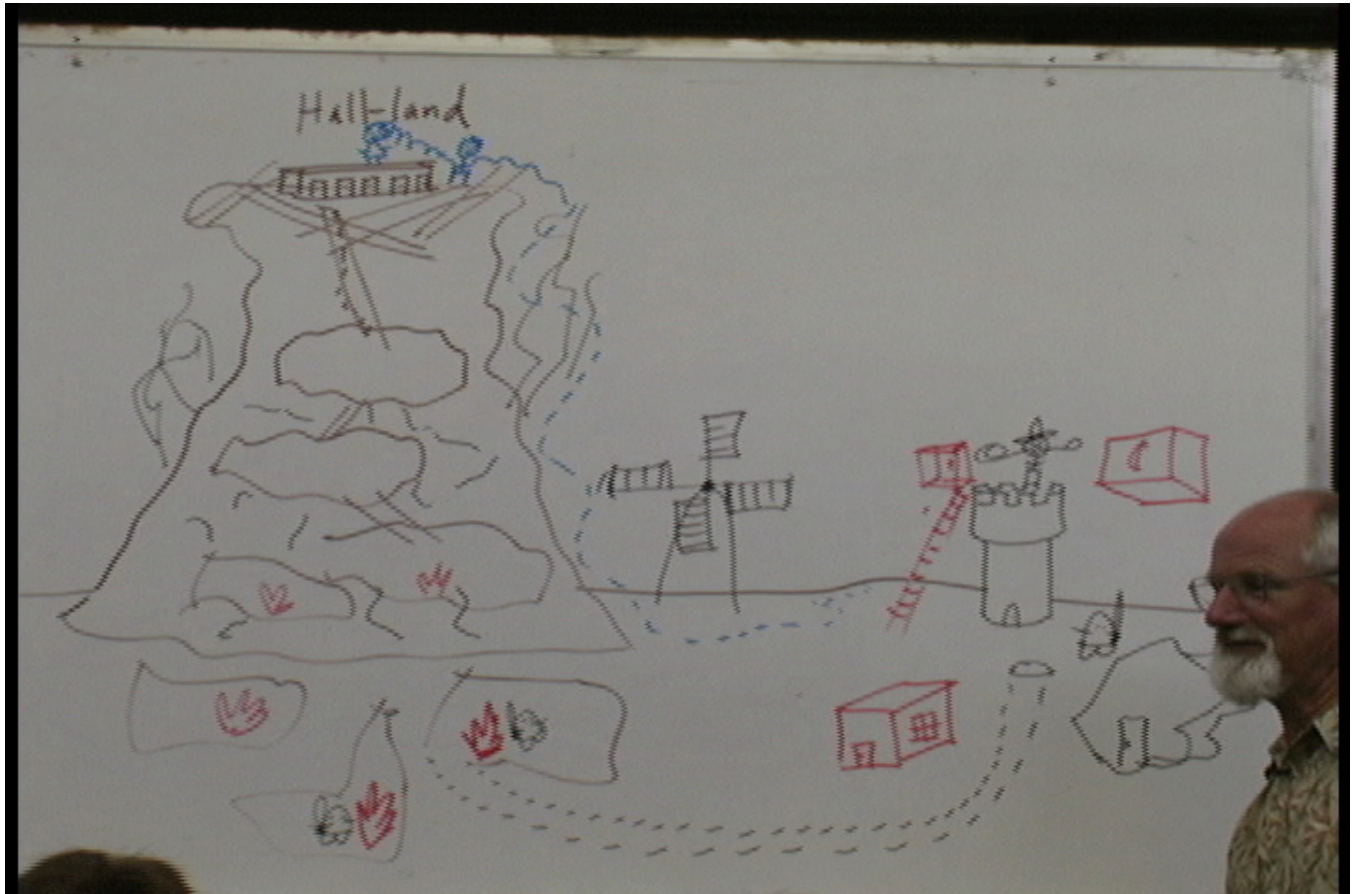
Tell about experiment with kites of three different sizes. The biggest one (6') lifted a kid off the ground. Good thing it was tied to a tree.

Somebody made a 30' kite and secured it to a dumpster with a steel cable. It was at a beach near the bay. When the wind caught it, the kite dragged the dumpster into the bay. They couldn't cut the rope because it was steel.

If wind blows at 60mph, it exerts .1 psi. For one square foot, that's 14.4 lbs. For a 30'x30' kite, that's about 13,500 lbs.

The Great Pyramid's limestone blocks weighed about 10,000 lbs. They could have been moved by a big kite.



Story:

There's a city made of all hallways, no rooms. It's on top of a mountain. Called Hall-Land.

It started with one hallway. Then other people came, so they had to build more hallways going in different directions.

They wanted the hallways to last, so they made them out of rock that they dug out of the mountain. This created chambers that were connected by more hallways.

The people got rich because lots of people came to see all the hallways, including Jack and Jill.

EMF came and decided to build a city with just rooms and no hallways.

Minions tried to build rooms by banging on the ground with their baseball bats to get big pieces of rock. Then they banged a doorway in it. EMF didn't like it because the rooms were all misshapen.

He ordered a giant cookie cutter from the ASOE so his rooms would be all the same shape. Minions would climb to the top of the castle, put the cookie cutter on their head, and jump off. When the cookie cutter hit the ground, it would make perfect square blocks. Then the minions added doors and windows.

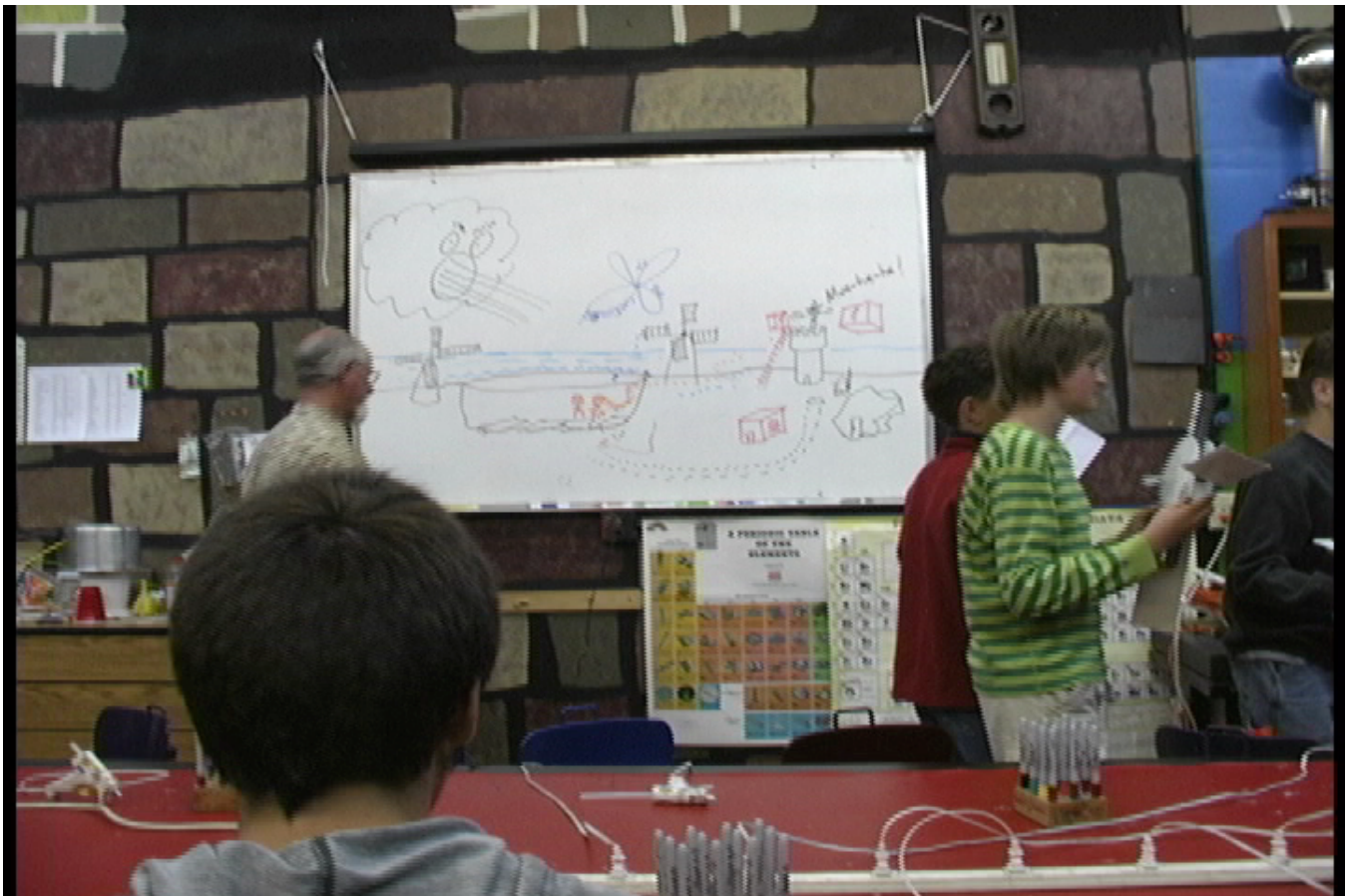
EMF showed off his rooms to the people there, but they liked the hallways better.

EMF told the minions to tunnel over to the people's underground chambers and cause problems. So the minions went over and started hitting people with their baseball bats. The people never knew when a

minion was going to pop up and hit them, and this made them very nervous. So they didn't want to go down into the chambers anymore. The minions had the chambers to themselves, so they decided to have parties, since EMF couldn't see them. They started making fires, which weakened the rock. Pieces started falling, but the minions didn't care.

Smoke from the fires bothered the people, so they built a big fan to blow it away. It worked for awhile, but the minions kept setting fires.

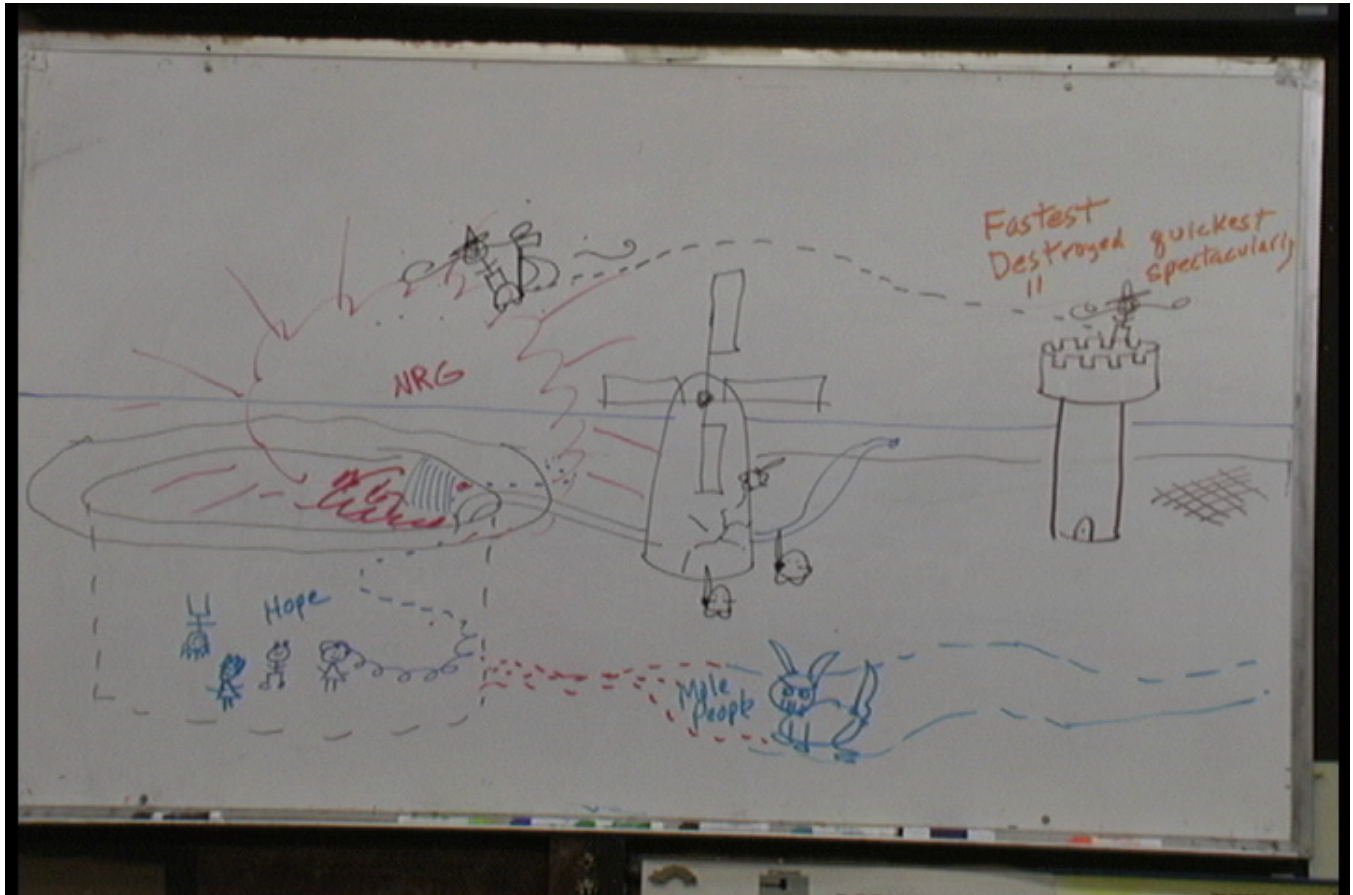
They also kept dancing, and after awhile the rock started to crack, and Holl-land started to shake and crumble, and it collapsed into a big pit, but the people survived. The minions got blown out through the holes. So Holl-land was now down in a hole.



The people started building more hallways down in the hole. EMF called the ASOE and ordered an ocean, which came right up to the edge of Holl-land's walls. Then he sent the minions over there to bang on the edge of the hole so the water started to flood in. The people built more fans and used them as pumps. They were able to pump the water out faster than the minions could make it go in. So EMF ordered a huge windstorm, and it blew so hard it blew the blades off their fans.

Story Ending (Week 2):

(The second half of the story doesn't pick up where the first half left off. The part about the windstorm is omitted, and there are mole people digging tunnels nearby.)



Jack went to talk to the mole people to find out how they could dig their tunnels so fast. They told him they use antimatter. Jack asked if they could use antimatter against water. They said they could, but it would also create hydrogen and oxygen gasses.

The mole people pointed their antimatter eye beams at the water and it started turning into hydrogen and oxygen and pure energy. So there was a cloud of explosive gas with a lot of light emanating from it. The people down in the hole started chanting.

EMF thought they had a superior weapon, so he flew over on his vacuum cleaner to look. Just then, one of the mole people looked up at EMF and turned him into a cloud of gas that exploded.

Week 1 Lesson:

Turn on a leafblower, direct it toward students so they can feel the force of the air, with and without the tube, and with a nozzle.

Objective is to make a fan that can withstand that amount of air and lift a 70-lb piece of railroad track off the ground.

They can build it using plastic film reels, pieces of foam, plastic cups, craft sticks, and cardboard. Various saws are provided to cut the cardboard; regular saw, coping saw, hack saw.

Need to make something that will capture the air, can be attached to the shaft of the testing station, and can spin. The shaft hooks up to a screw on a vertical threaded shaft. When the fan turns, the shaft will turn, making the screw move up, which will lift the railroad track. Students have to lift it up to the height of an aluminum block (about 6"), then put it back down again. See who can do it the fastest.

Students work in groups of at least two, but not more than four. All students in the group can use a leaf blower at the same time.

Set up glue guns.

Students build their fans and test them.

Week 2 Lesson:

Categories of winning: 1) Spins Fastest; 2) Is destroyed fastest; 3) Is destroyed spectacularly.

Students modify their fans and test them again, using a voltmeter to see how high the reading gets as the fan goes faster.

At one point, Instructor turns on a strobe light to see what the fan looks like under the strobe.