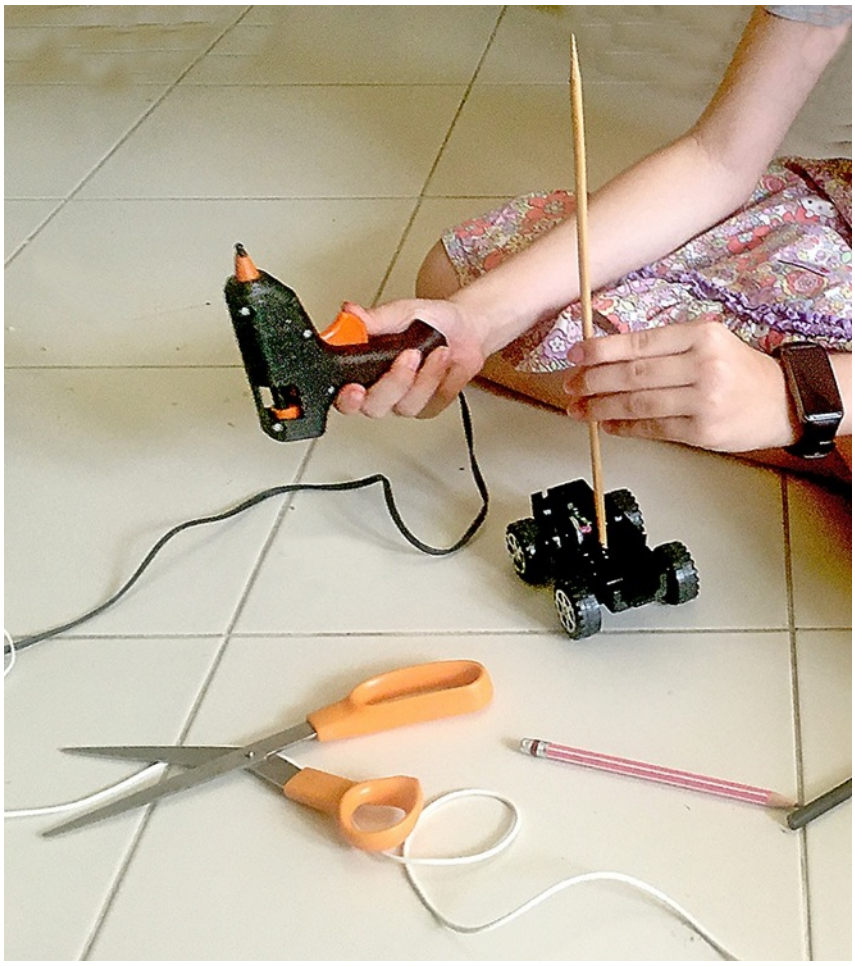
# A Model Land Yacht

*Shannon and Ian Jacobs*

Science teachers at my day school give home projects. Make something and submit a video by Friday. The latest one was …

> "*Make a vehicle to go three metres in a straight line under its own power in less than 10 seconds*."

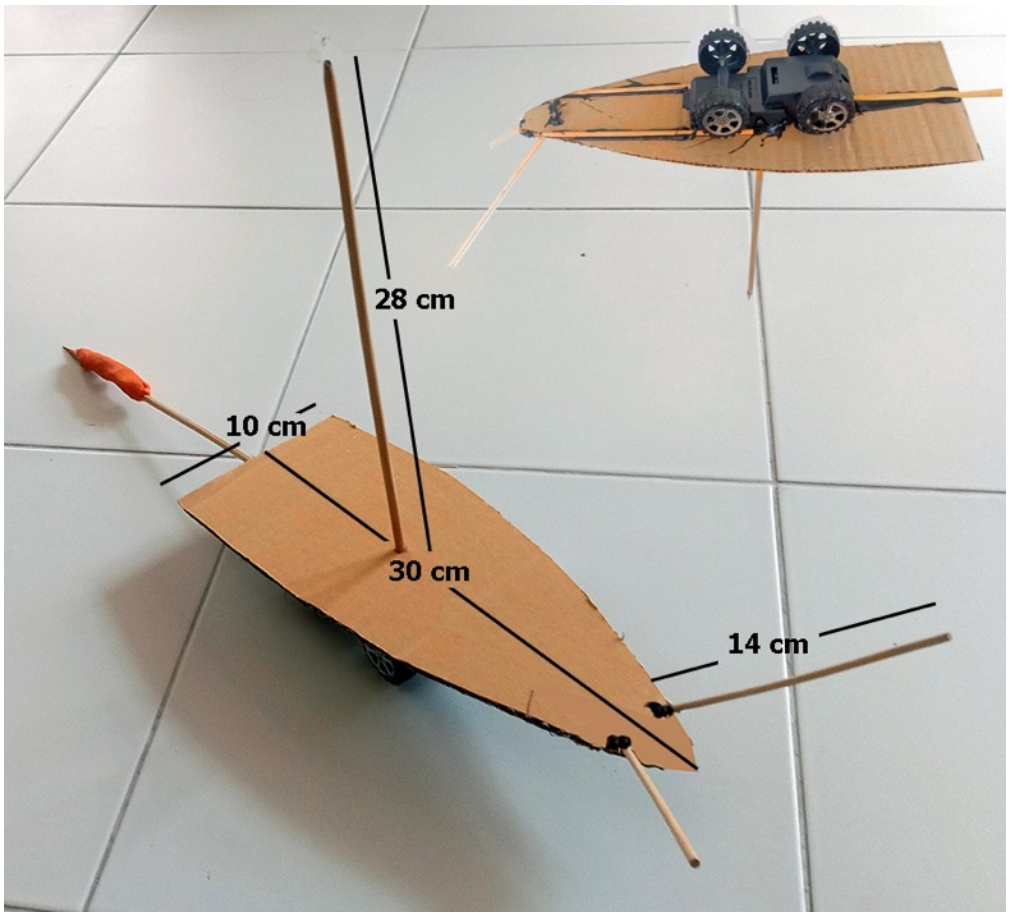
We had: hot glue, clay, cardboard, skewers, a plastic bag, scissors and a plastic trolly from a broken long-forgotten toy. I (Shannon) wanted a land yacht and checked that wind from a fan was an allowed power source.



I fixed the mast firmly in the trolly before thinking about how to make it look like a yacht.

A sailing yacht has a keel weighted with lead. Without that it falls over in a wind. Not pretty. This one can't have a keel and must stand up in a tail-wind so it has a ballast beam out the back to stop it tumbling forwards.

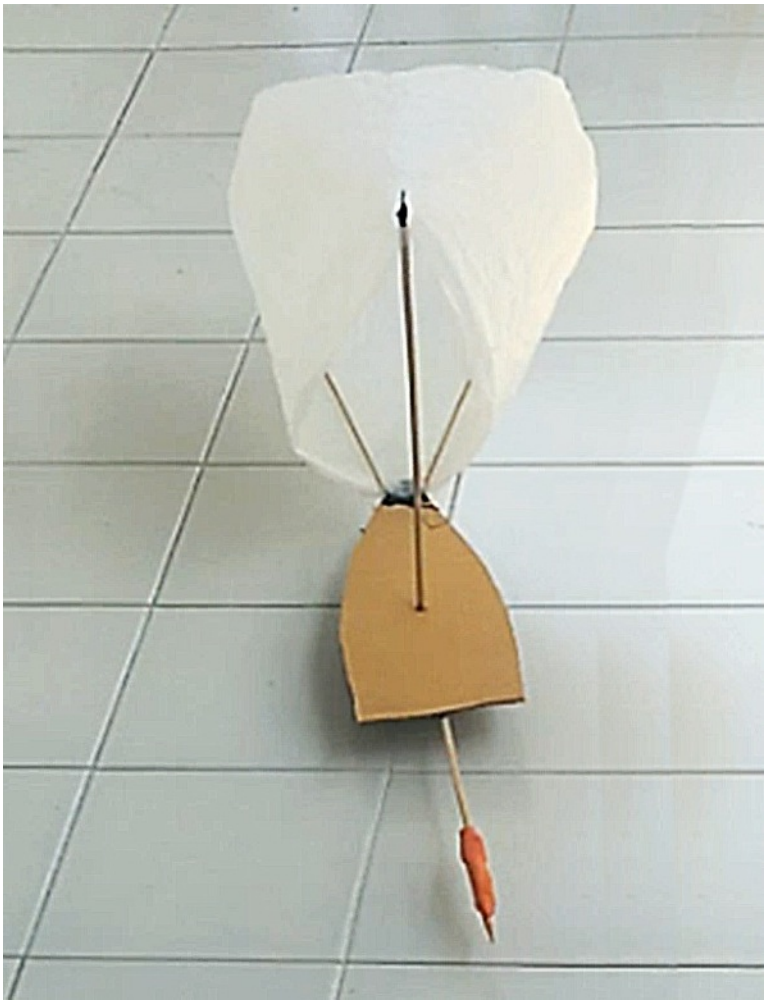
## The model




The model has wheels, deck, mast, ballast beam and three attachment points for a sail. The sail is really important. The contraption must go in a straight line in a gusty wind so it must self-correct without anyone steering.

A triangular spinnaker that fills like a balloon might collapse in a wind gust or if the boat veers to the side. A fixed sail might work, but it should look like a sail if we're going to call this a yacht. I knew that balloons stay suspended in the wind above a fan if it's on it's back on the floor.
I needed something that would fill with the wind like a sail but have a stable convex shape like a balloon. The design solution follows.

**The self-correcting down-wind sail**



A plastic shopping bag was cut across the top to remove the handles. The two long bow struts spread and partly secure the sail with an open back section. As the wind builds the sail fills.

The boat has veered left in this frame from the video linked below. The ballast beam is clear of the floor. The sail is well forward of the wheels and the boat is about to correct right. Further work is required to determine the mechanism for the course correction that *may or may not involve the Bernoulli effect that keeps a balloon in the air-steam above a fan*.

> Video of the maiden voyage on flickr shows the passage of the yacht over 10 metres in 7 seconds with repeated course corrections. The fan was below the camera.