

Fluids and Resistance Lurking Around Us



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Motivation



Maximum speed

Roughly 90 km/h

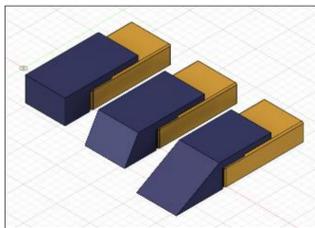
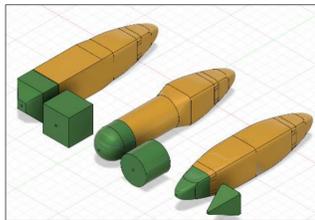


Roughly 120 km/h



Experimental tools

Dynamics trolley
Circulator
Vertical wind tunnel
Model (created with a 3D printer)
3D printer
Incense
Matches
Spring balance



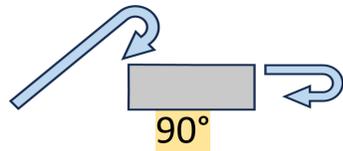
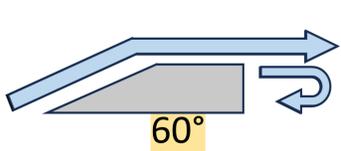
Experiment 1

Air Resistance Visualization Method:

Visualizing air resistance using incense sticks .

- ① Create a model using a 3D printer.
 - ② Install the models on a mechanical bogie.
 - ③ Attach a spring to the machine cart.
 - ④ Apply air to the machine trolley.
- *The weight of all models is uniform at 30g.

Results and discussion 1



The sharper the tip shape, the more air flows backwards without waste. Conversely, if the tip shape is not sharp, it is difficult for air to flow backwards.

angle(°)	Average mutation (cm)	Standard deviation (cm)	Times
30°	5.08	±0.58	15
60°	5.95	±0.50	15
90°	7.42	±0.36	15

Based on Experiment 1

Through experiment ①

Insufficient as not quantified.

I thought up a new experiment.

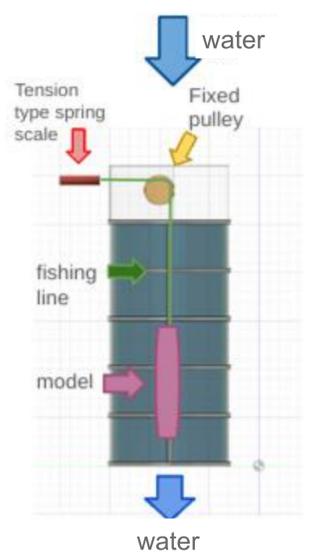
A new experiment

Measuring Distance Traveled

Method: Quantification using a spring scale .

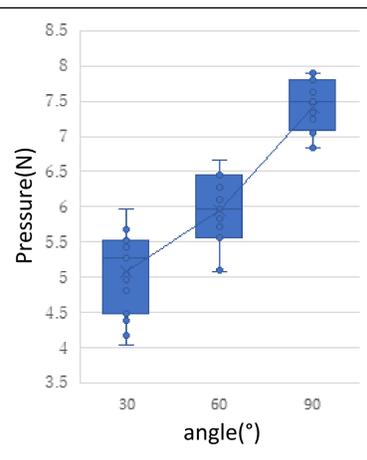
- ① The model is placed in the wind tunnel.
- ② The spring is installed in the same manner.
- ③ Blow the water onto the model.
- ④ Read the spring value.

Image



Results and discussion 2

See attached graph.
The results of the experiment showed that the sharper the tip shape, the less resistance it faced.



Summary

The experiment showed that the sharper the shape, the less resistance there is.

I would like to investigate whether the angles of the shapes actually used in rail vehicles have any other reason than air resistance.