

# Design of a Snow Sledge using Multiphysics Analysis



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## Abstract

Sledding is a worldwide winter activity, exercised most often in a prone or seated position requiring a device or vehicle generically known as a sledge or toboggan. There are few types of sleds commonly used today such as runner sleds, toboggans, disks, tubes and backcountry sleds. Each type has advantages and disadvantages with different slopes. The objective here is to design and optimise a snow sledge using Multiphysics tools for the shape and weight. Further to the design, part manufacturability is also included in the study where appropriate material is selected based on the evaluation.

In this work, various geometric models are fabricated using Solidworks® CAD Package. Special attention is given in the design of damping and steering mechanism of the snow sledge. MATLAB® Simulink was used to study the dynamic response of the damping and steering system. The SolidWorks® 2014 plastic moulding module is used to simulate the manufacturing process. In this simulation, material for the part is fed into a heated barrel and forced into a mould cavity, where it cools and hardens to the shape of the cavity. One of the key factors found in the study is the thickness of the part. Efforts are being made to optimize the geometry to reduce the thickness without affecting the structure of the parts.

## Design of Damping System

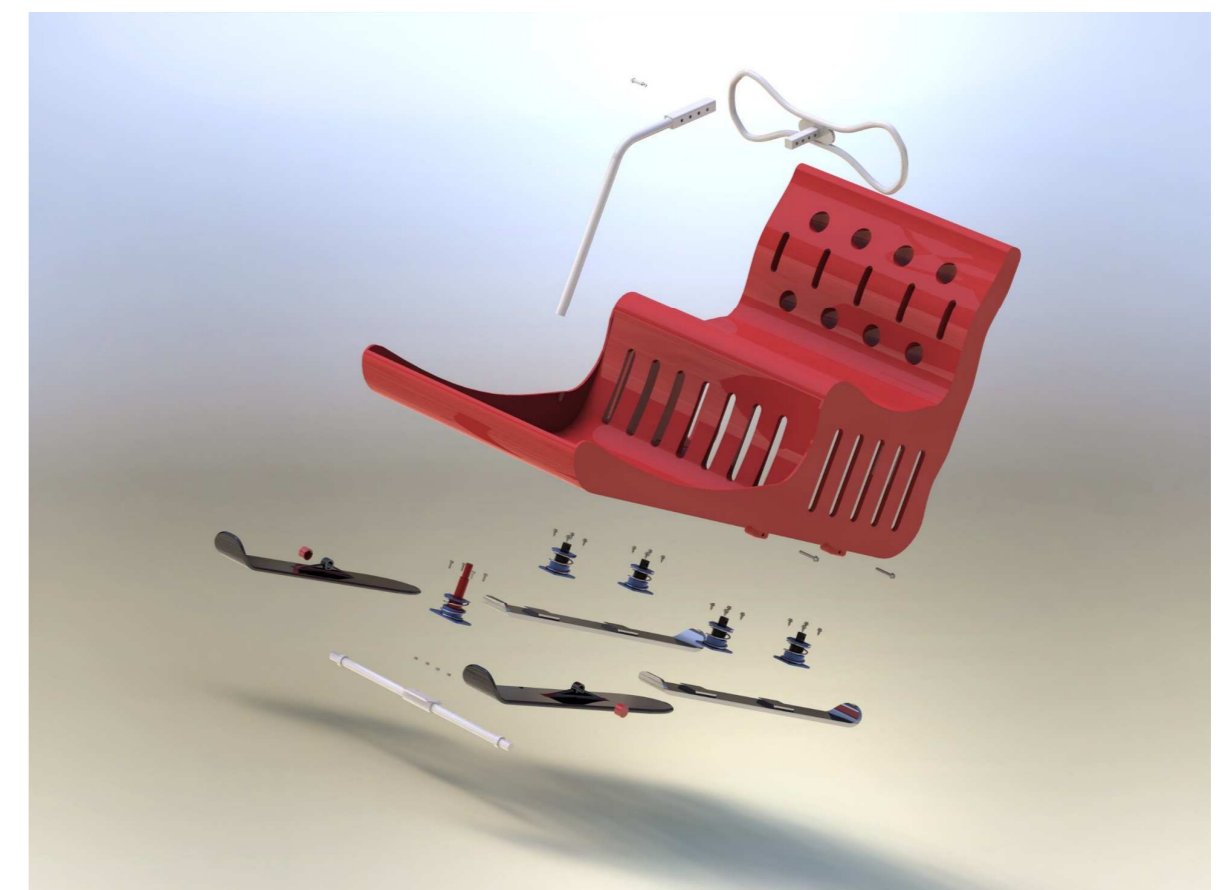
Damper



Exploded view of Damper



Installation of Dampers on Snow Sledge

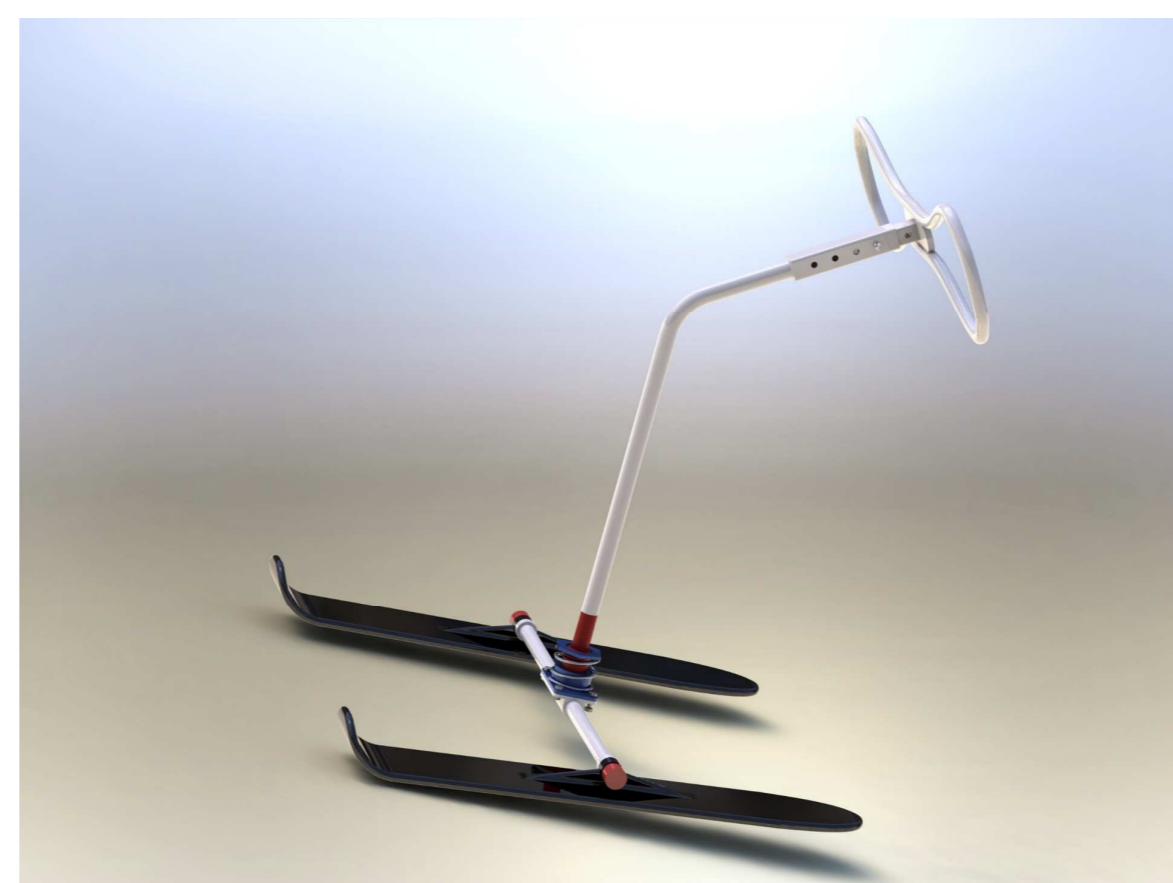


## Design of Steering System

Control Ski of Snow Sledge



Steering Mechanism of Snow Sledge



Fully Installed Configuration of Snow Sledge



## Conclusion

Damping and steering systems are vital in functionality of snow sledge. Shown work is a novel design of a damping and steering systems for a snow sledge. In addition to design, manufacturability of the parts is also taken into consideration.

## Recommendation

Next stage to this work is the prototyping where some parts of the given design can be manufactured using 3D printer facility. Produced parts can be assembled to build a prototype which can be tested for the proof of concept.

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