

Longboard Truck Optimization

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Problem

Determine the relationship between ride height and rake that maximizes the traction that a longboard truck can achieve.

Abstract

The purpose of the research was to determine a relationship between two key design parameters of a reverse kingpin skateboard truck and the resulting maximum traction between the wheels and pavement. The parameters evaluated were ride height (distance from axle to the bottom of the board), and rake (the amount the axles are offset from the axis of rotation, which is established by a line drawn from the center of the pivot through the midpoint between the bushings). An experimental apparatus was designed to isolate these two parameters from characteristics that vary from one truck to the next.

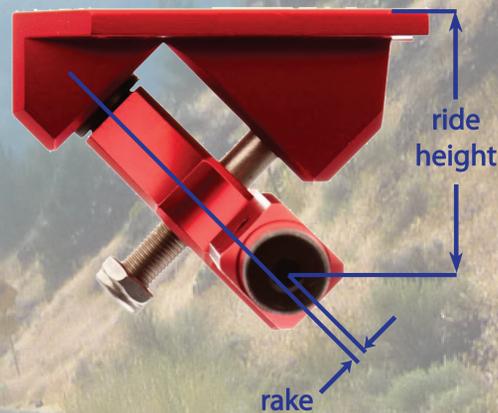


Illustration shows the two key parameters in the experiment, ride height and rake, for a reverse kingpin style truck. Rake is negative as shown; positive rake exists when axles are on other side of the axis of rotation. When axles are inline with axis of rotation the truck has no rake. (photo credit: Surf-Rodz)

Experimental Design

The testing apparatus was designed to reduce the complexity of a complete longboard so that the effects of ride height and rake could be isolated.

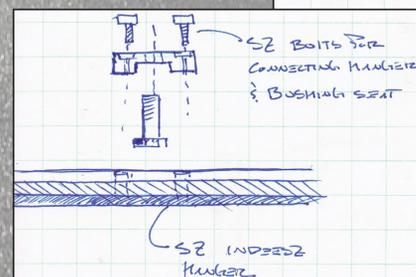
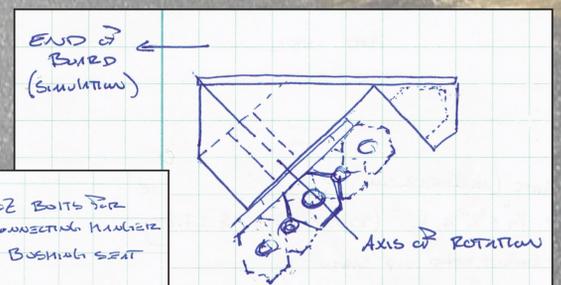
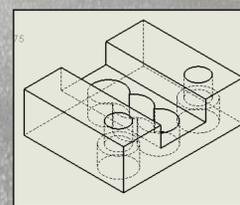
Typical Parameters

- Ride height
- Rake
- Hanger width, axle precision
- Bushing loading
- Pivot cup fit
- Flex of board

Testing Apparatus



- Ride height adjustable using shims
- Rake adjusted using custom hanger mount
- Same two machined hangers used in each trial
- Mechanical stop used in place of bushing
- Axis of rotation constrained by bolt
- Aluminum plate used to simulate rigid deck



Sketch showing rake options (above)
Sketch of assembly of hanger mount (left)
CAD drawing of hanger mount (top left)

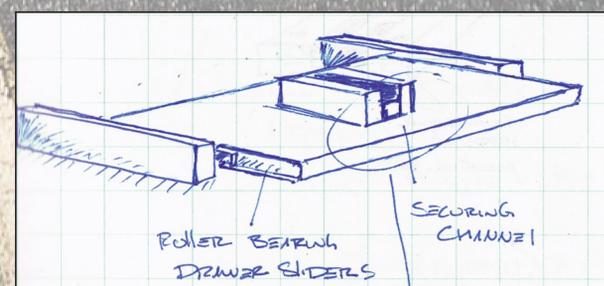
Additional Consideration

"Securing channel" used to prevent rotation of deck.

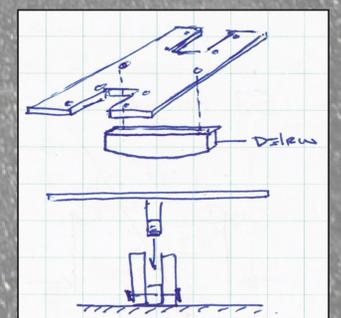
Flaws in Experiment

Uneven platform, in conjunction with limits of the mechanical stop, prevented all four wheels from contacting evenly.

Needed to understand material properties of the urethane wheels to create an accurate model of real world use.



Platform with securing channel



assembly of deck & components for securing channel

Conclusion & Future Steps

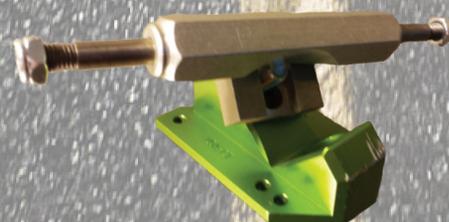
Despite attempts to isolate the effects that ride height and rake have on traction no usable data was collected as a result of the inconsistencies with the testing apparatus. Peak values of traction varied widely for the same configuration of ride height and rake, largely as a result of inconsistent contact between the wheels and platform surface.

In future testing, the platform and mechanical stops need to be redesigned to allow proper contact between the wheels and ground.

Wheels used in the experiment should be tested ahead of time to determine their coefficients of static friction as a function of normal loading. Dimensional analysis can then be used to create testing conditions that properly simulate real world application.



Actual testing setup



Positive rake position 1, no mechanical stop shown

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