The WAVE Surfboard Rack
ME153 June 8, 2007
Team Leader: Laura Wilson
Team Members: Chris Magcamit, Josh Silverman

Abstract
Current surf racks have mastered the art of attaching a surfboard to all sorts of vehicles, but, at this point in time, current designs have yet to address difficulties of loading onto larger cars and therefore fall short in terms of ease-of-use and convenience.

The purpose of the WAVE Surfboard car rack is to create a surf rack that meets the same standards of stability and reliability while creating a simple, easy to use device that further simplifies the loading and unloading process.

Benchmarking
Many vehicles are equipped with roof mounted rack systems to which most surfboard racks are attached. The existing attachable surfboard racks are flawed due to the fact that they utilize the same design regardless of the size or model of the vehicle. Detachable surfboard racks are composed of a set of straps and a foam padding on which the surfboard rests. Loading detachable surfboard racks involves adjusting straps on both sides of the vehicle to secure the board, which is no easy task for large vehicles.

For our Benchmark we used Yakima Control Tower with the WetSand Pad and Easy Strap Set.

Design Evolution
The car-top surf rack market places a high value on simplicity and effortlessness, as well as stability, therefore the design objective was to incorporate these existing properties into a new design that improved upon the loading process.

The initial problem was the inherent difficulty in roof top loading for larger cars, which led to the concept of loading the surfboard on the side of the car. The next evolution therefore introduced the concept of a translating rack system. This design marries the benefits of the traditional roof rack with the ease of a side loaded rack.

Final Design
The main advancement in the design was achieved when the original pull-out/ drop-down method was replaced with a gradual lowering system; this dictated that the design could not be based off of a rigid frame. By constructing the overall frame from smaller, hinged sections the surfboard rack could then be lowered to the side of the car in a fluid arcing fashion.

In order for the frame to curve easily, the sections of the frame needed to be relatively small. If the rigid surfboard was attached to the moving frame, the curvature would be prohibited; therefore, the surfboard could only be attached to a single section of the frame. Hooks were installed on the first frame section that extended the width of the surfboard, to which existing detachable surfboard tie downs could be attached.

From our original concept, we kept the idea of mounting the frame to the pre-existing roof racks on the vehicle; however, since the frame needed to roll over the edge of the car in sections, the frame could not attach directly to the roof rack. A track with a curved end was developed that would attach to the mounted roof racks and allow the sectioned frame to roll easily over the edge of the car. Since the overall goal of the project was to maximize its ease-of-use, the device was automated by installing a motor to drive the device.

Conclusion
The primary goal of the WAVE was met and exceeded in its attempt to increase the ease of loading surfboards on vehicle roofs. The side loading application was the key to eliminating the problems associated with existing roof loading surfboard racks. In addition, motorizing the system allowed for ultimate ease-of-use. In the existing prototype, the device is powered by a motor attached to the roof of the vehicle; in the final product, the device would ideally be powered by the car’s battery.

The WAVE surfboard rack could be developed further to accommodate equipment such as canoes, kayaks, skis, and snowboards, as well as luggage or cargo. In addition to recreational gear, the device could be modified to transport medical equipment, such as wheelchairs and motorized scooters. The WAVE provides increased ease for maximum enjoyment.

Acknowledgments
We would like to acknowledge the following people for their contributions:
Professor Steve Laguette Design Advisor
Consolidated Overhead Door and Gate Supplies Contributor

References
Consolidated Overhead Door and Gate
http://www.consolidatedoverheaddoor.com/codg/
WetSand Pad and Easy Strap Set
Yakima Control Tower
http://www.wetsand.com/product.asp?locationid=4&ProdId=1119&CatId=920&TabID=890&SubTabId=920