MAE 188
Spring 2019
EDI: Engineering Design in Industry
An Industry and University Engineering Collaboration

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Cargo Valet™

Cargo Valet is a fully automated, self-loading cargo container mounted to a vehicle’s roof rack or in the bed of a pickup truck. The Cargo Valet enables a person of any size to single handedly load luggage or equipment into the container affixed to the top of their car, SUV or van, regardless of the height of the vehicle’s roof (Max. Load ~ 300 lbs). A utility version will be designed for installation in the bed of a pickup truck, capable of lifting 1,000 pounds.
Background - A Phase I study was conducted at UCI during the Winter 2019 quarter (MAE188). During Phase I, five ME seniors established preliminary design configuration of SUV and Pickup shells, performed initial FEA and CFD analyses, calculated loads and torques, selected initial components, and simulated the kinematics.

Phase II expands the team 13 interdisciplinary members, including (6) ME’s, (2) AE’s, (2) EE’s, (2) CSE’s and one Civil E. Our goal is to meet Critical Design Criteria in order to build a prototype by summer.
Cargo Valet™ Phase II

Task 1:

• Optimize Shell Designs
• FEA - Make minor changes to shells to minimize stress at load concentration points. Add ribbing and metal support plates where necessary.
• CFD – Smooth all wind surfaces (especially on SUV version) to minimize drag and improve “aerodynamic look”
Cargo Valet™ Phase II

Task 2:

• Mechanical Component selection and Dynamic Load Analysis
• Select mechanical components for optimal price / performance.
• Perform dynamic load analysis of completed mechanical assemblies.
Cargo Valet™ Phase II

- Electrical Load Calculations, battery and solar panel selection and placement,
- Selection of controller and programming of PLC to perform all electro-mechanical functions, including:
  - Actuators to raise/lower shell
  - Motor to move tray in/out
  - Conveyor
  - Door actuators and locks
  - External clamping
Cargo Valet™ Phase II

Task 4: Department of Transportation Requirements -

• Investigate max height and weight, CG and test requirements for both versions