Vision

• Make biking safe, dry, and happy

• Effective bike rain shield

• Collapsible & convenient
Market

• End users:
  – Urban bike commuters
  – Regular bikers

• Estimated Price: $150

• Customer Advocates:
  – NEMO Equipment: High-performance tents
  – Roof For Two: Weather protection accessory for motorcycle riders
Customer Feedback

• Not concerned as much about lower body getting wet

• Concerns: Visibility, size, and coverage

• Online interest
# Product Contract

## Customer Need | Attribute | Engineering Specifications
---|---|---
Rain protection | Dry volume in a certain wind | Coverage ≥ Rain jacket
Speed | Speed reduced from 16 MPH with same biker power | New speed > 10.4 MPH
Compact and moveable | Collapsed volume, shape, and weight | Fits in bike basket volume: 9.3 by 16.1 by 13.6 inches; Under 10 pounds
Situational Awareness | Visibility/Sound | Noise ≤ Umbrella Vision ~ Goggles
Quick deployment | Time | < 2 minutes
## Product Contract

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Risk #1: Coverage & Cross-Wind

• Modeled wind & rain

• Considerations:
  – Front panel height & width (H & W)
  – Side panel height (c)
  – Desired dry area height & width (h & w)
  – Angle of rain ($\theta_R$)
  – Forward, rain, & side wind speeds
Risk #1: Coverage & Cross-Wind

Raindrop Analysis

Available Dry Height: 0.495 m
Available Dry Width: 0.2077 m
Rain Protection: 73.45 %
Force: 4.69 N
Torque: 8.67 N*m

Desired Height Dry (m): 1.2
Rider Width (m): 0.6
Biking Speed (m/s): 4
Umbrella Height (m): 1.00
Side Wind Speed (m/s): 5
Umbrella Width (m): 0.9
Rain Speed (m/s): 6.5
Curtain height (m): 0.3
Risk #2: Speed Reduction

Riding Power (watts) vs. Riding Speed (mph)

- Normal Bike
- With Raindrop

Comparison at:
- Riding Power: 10.5 watts for Normal Bike, 13.5 watts for With Raindrop
- Riding Speed: 13.0 mph for Normal Bike, 13.5 mph for With Raindrop

RainDrop Bike Dry.
Risk #3: Collapsibility
Next Steps

1. Look into other mechanisms for collapsibility
2. Design & integrate storage unit
3. Refine shape
4. Improve attachment to bike
5. Find suitable materials