Sketch Model Presentation: HUD Helmet
**HUD Helmet** | **Motivation**

**Safety:**
- Wearing helmet increases chance of survival by 37%
- ~4,500 motorcycle deaths annually; of which 58% wore helmets

**Market:**
- >7 million registered motorcycles in the US

**User Feedback:**
- Looking down is dangerous/undesirable
- Pulling over to look at directions can cause 2X travel time
- Would pay X3~X5 normal helmet cost
- Want to hear road sounds
HUD Helmet | The Product

Heads Up Display Motorcycle Helmet:
Projects important information to riders
Main Features:
- Heads up display
- Communication with SmartPhone: Navigation

Other Possible Features:
- Microphone
- Single earpiece
- Variable display brightness
HUD Helmet | View from Sketch Model
Basic Requirement:
- Collimator has to make light rays parallel (or close)

Variables:
- Size of display
- Size of lens
- Focal length

Affects:
- Field of view
- Magnification
- Distortion
HUD Module
- Smaller display
- Smaller lens
- Possibility of multiple lens for collimator
- Less distortion

Overall Helmet Architecture:
- Space constraints
- Location of battery, board, other components
Thanks, questions?
Backup Slides, Q&A

HUD Helmet
Magnification = \frac{F_{lens}}{F_{eye}} = \frac{S_{image}}{S_{object}}

S_{image} = S_{obj} \times \frac{F_{lens}}{D_{eye}}

F/\# = \frac{F_{lens}}{D_{lens}} \quad (blurry?)
\[ \frac{1}{S_1'} = \frac{1}{f_1} + \frac{1}{S_1} \quad \frac{1}{S_2'} = \frac{1}{f_2} + \frac{1}{d - S_1} \]