

Overview of the MSF 100 Naturalistic Riding Study



Mac McCall 9/26/2015



Who is VTTI?

- VTTI is a transportation research institute located at Virginia Tech
- Blacksburg VA
- Established in 1988
- Research for public and private clients
 - Cars
 - Trucks
 - **Motorcycles**
 - Roadways
 - Bicycles



Types of Research

Experimental

Controlled Experiments
 Manipulate an independent variable
 Measure a dependent variable
 Lab, Test Track, Simulator



Naturalistic

Some of both



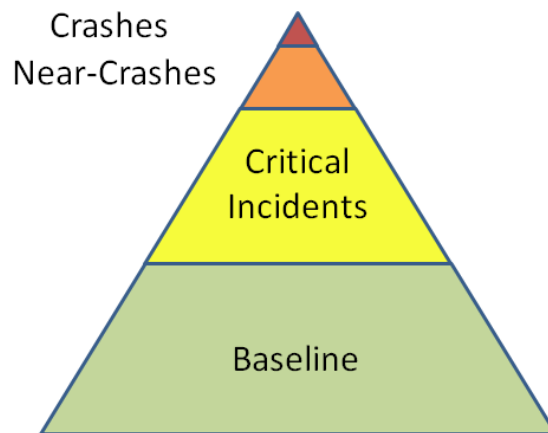
Epidemiological

Passive Collection
 Naturally occurring events
 Sampling Strategies
 Health sciences



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Naturalistic Methodology

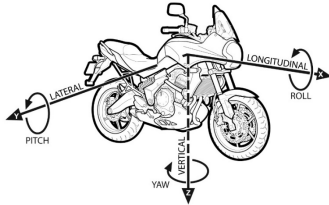


- Identifies factors in crashes using time-series video and numeric data.
- Reveals factors not detectable through crash investigation.
- Compares crash involved rider to himself / herself at all other times.
- Provides pre-event data.
- Permits study of how crashes are successfully avoided.
- Permits quantification of rider performance and behavior in non-critical and critical riding.
- Provides flexible and accurate analysis of risk exposure.
- Permits systems development and testing with real-world data.
- Can be used to answer research questions that arise in the future.





MSF 100-Motorcyclist Naturalistic Study



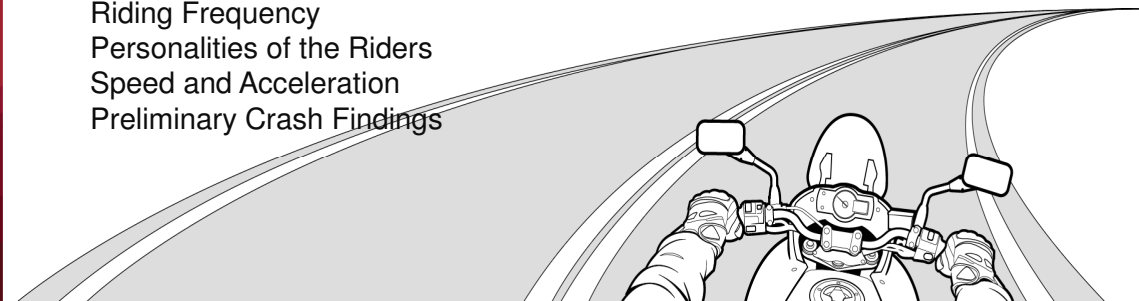
Contents:

General Overview

- Objectives of the MSF 100
- Participants in the MSF 100
- Equipment and Data Views

Preliminary Findings

- Mileage and Riding Times
- Weather
- Riding Frequency
- Personalities of the Riders
- Speed and Acceleration
- Preliminary Crash Findings

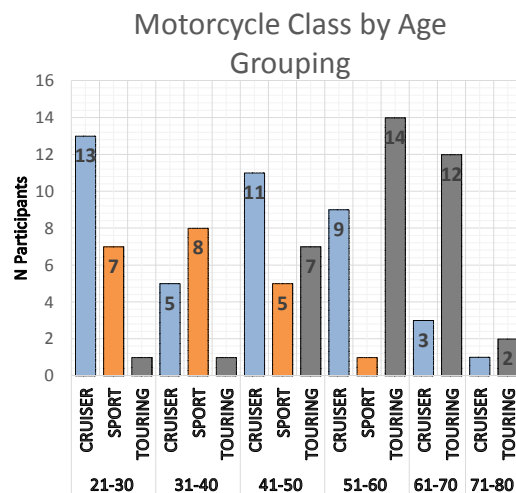


Objectives and Areas of Interest

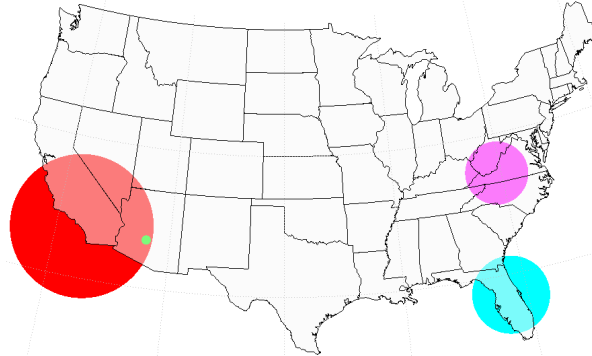
- Understanding:
 - Natural riding
 - Causes of crashes, near-crashes, incidents
- Guide development of MSF Curriculum
- Identifying strategies for avoiding crashes
- Areas of Interest
 - Rider demographics, history, personality
 - Rider behavior in normal situations
 - Environmental factors
- Events
 - Factors
 - Behaviors
 - Sequence
- Rider Differences

The Riders

- 100 Participants (72 male)
- Personal Motorcycles instrumented for between two months and two years.
- August 2011 through December 2013
- Personal motorcycles fell into one of three classes
- Participants ranged in age from 21 – 79 years old



Their Installation Location



- California (Irvine)

- Year-round riding
- Mixed traffic densities
- Geographic overlap with past studies

- Arizona (Phoenix)

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- Mixed traffic densities
- High concentration of sport bikes

- Virginia (Blacksburg)

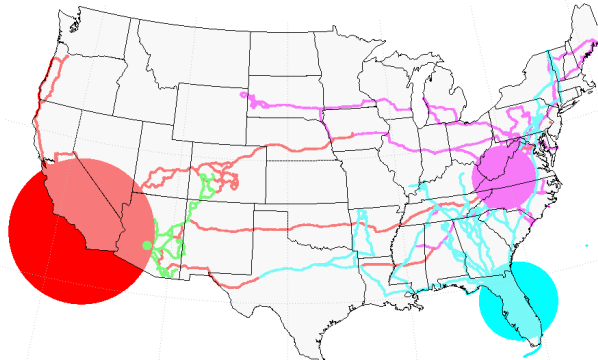
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- Two-lane with hills and curves
- Geographic overlap with automotive studies

- Florida (Orlando)

- Conditional helmet law
- Mandatory training
- Flat and straight roads



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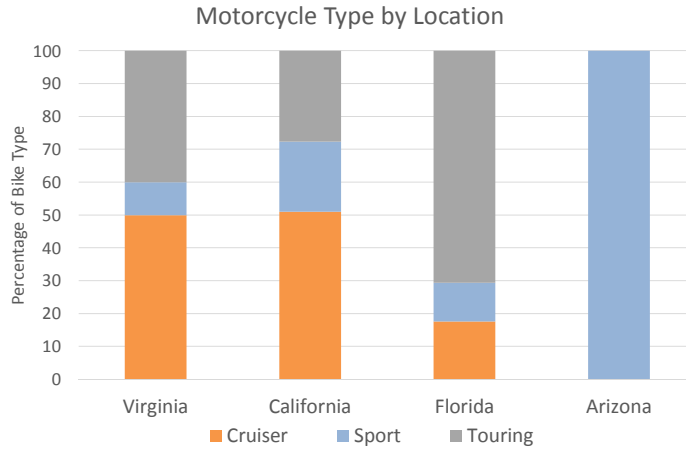
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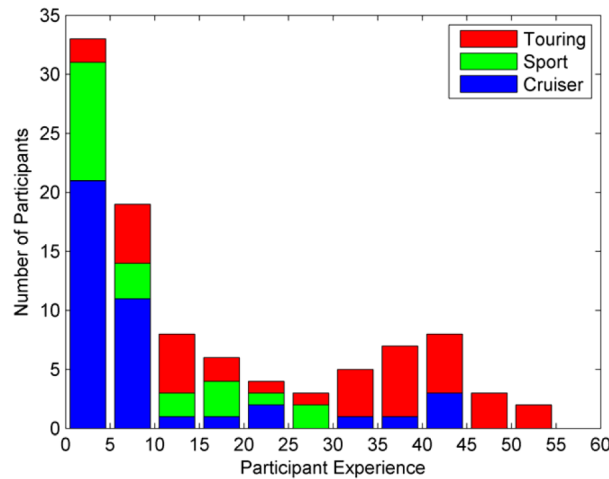
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Bike Type by Installation Location



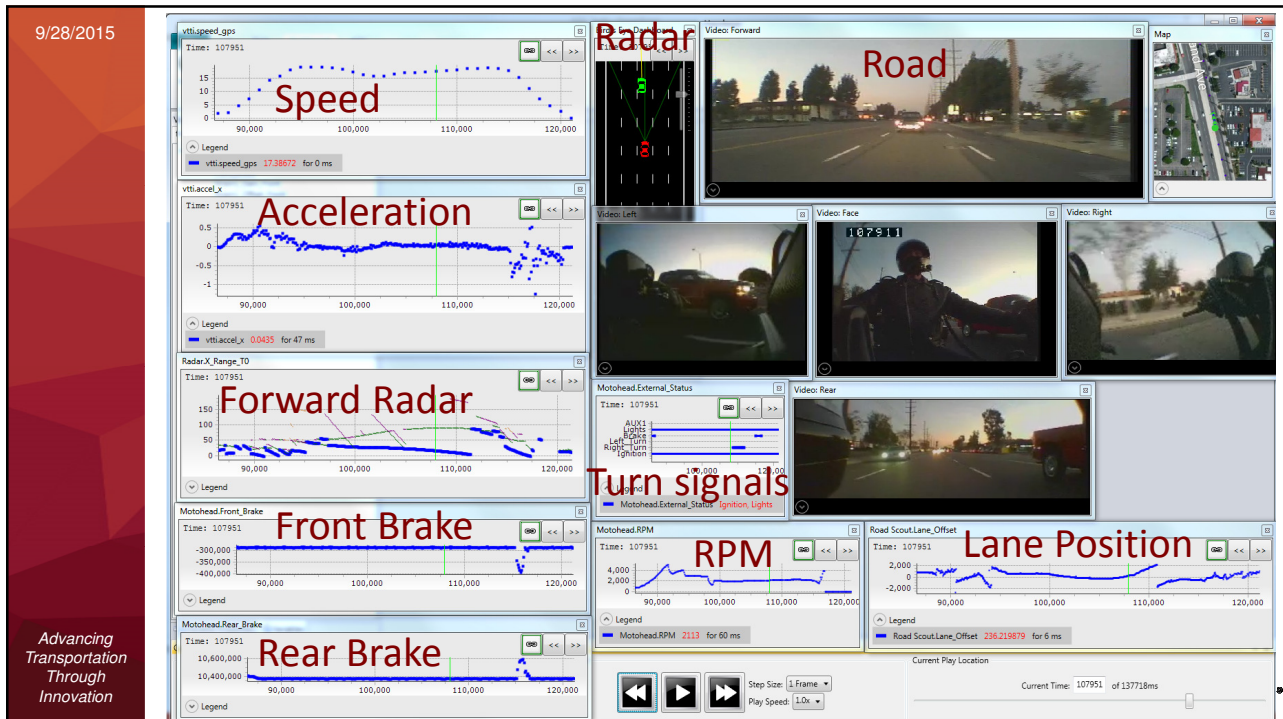
Participant Experience Riding by Bike Type



The Equipment



- GPS
- Machine vision lane tracker
- Accelerometers (3 axes)
- Gyro (3 axes)
- Forward radar
- Turn Signals
- Brake lever inputs
- Continuous collection
- 8-12 mo capacity
- Cellular communication from bikes back to VTTI
- Five color cameras
 - forward
 - rear
 - left
 - right
 - rider



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Mileage and Riding Time in the MSF dataset

- Riders combined for approximately 350,000 miles of travel over 8,776 hours in the saddle
- The average rider in the dataset rode 4,300 miles per year
 - Low of 89 miles
 - High of 16,228 miles
- Average trip covers 11.7 miles over 17.75 minutes with no differences between low and high frequency riders

The impact of weather on riding

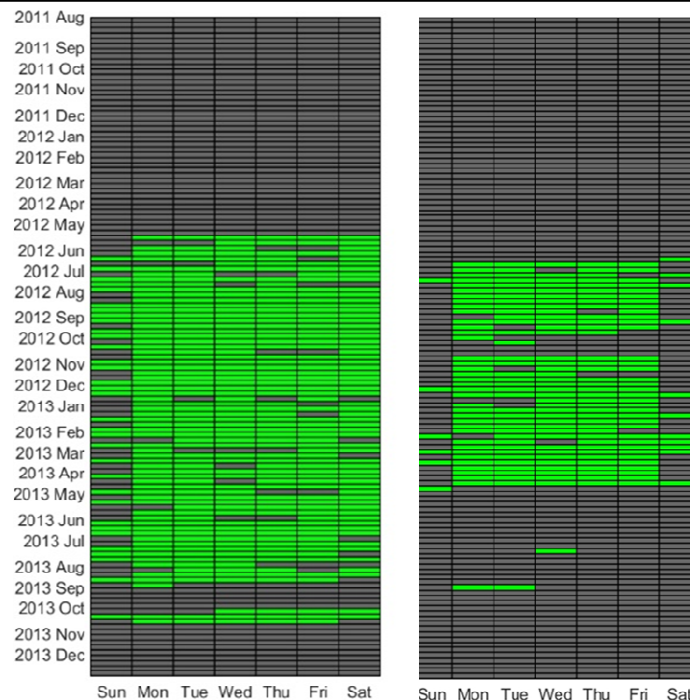
- Roughly 95 percent of rides were found to occur between 47.5°F and 93.5°F.
- 66% of rides occurred between 61 and 81°F
- Riders were rarely found to ride in precipitation (3% of trips)
- Riders in Virginia demonstrate a more pronounced riding season than those in the California group.
 - Virginia riders took 80% of their trips between the months of April and October, a seven month window.
 - California riders took 66% of their trips over the same time period.

High and Low Frequency Riders, when they ride

- Frequent riders were found to ride, on average, 145 days per year.
- Infrequent riders were found to ride, on average 30 days out of the year.
- Range from two days to 306 days of riding per year



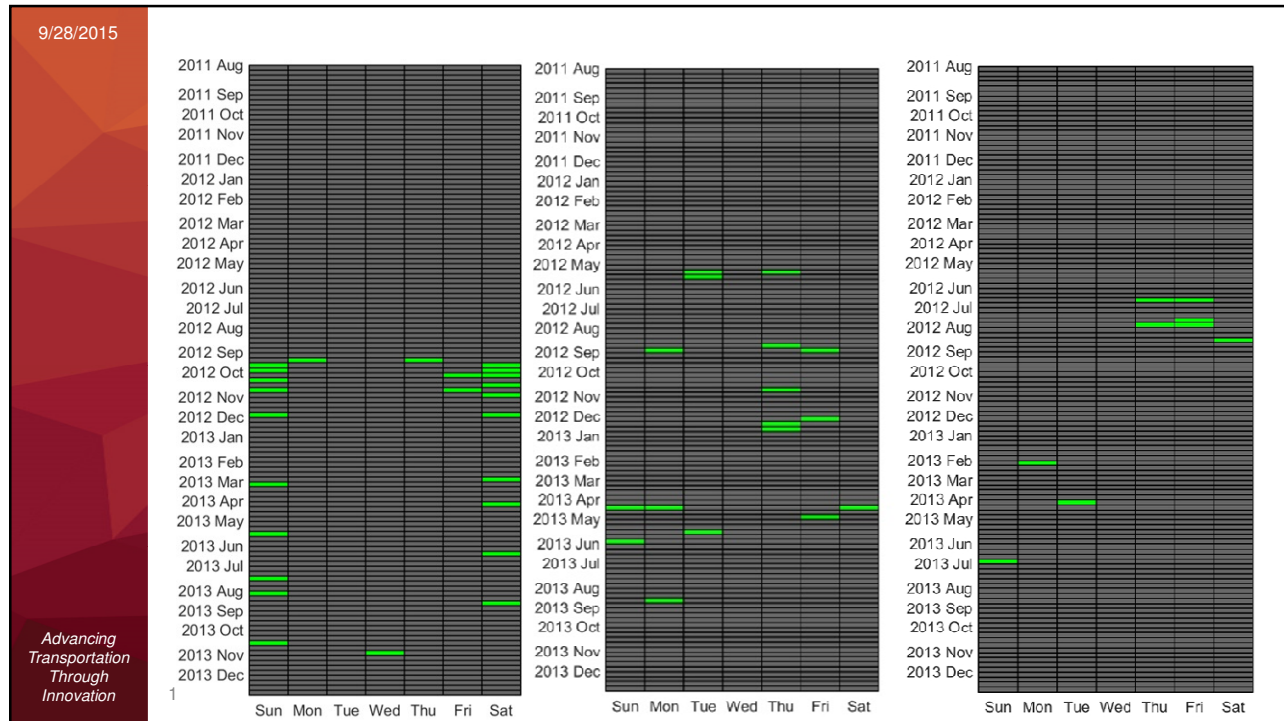
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Personality Comparisons

- When we compared Sport, Touring, and Cruiser riders in the study on all those questionnaire results, we found almost no difference.
- Touring riders had slightly lower measures on the neuroticism scale than sport bike riders.
- No differences found in any of the others – risky behaviors, conscientiousness, dangerous driving.

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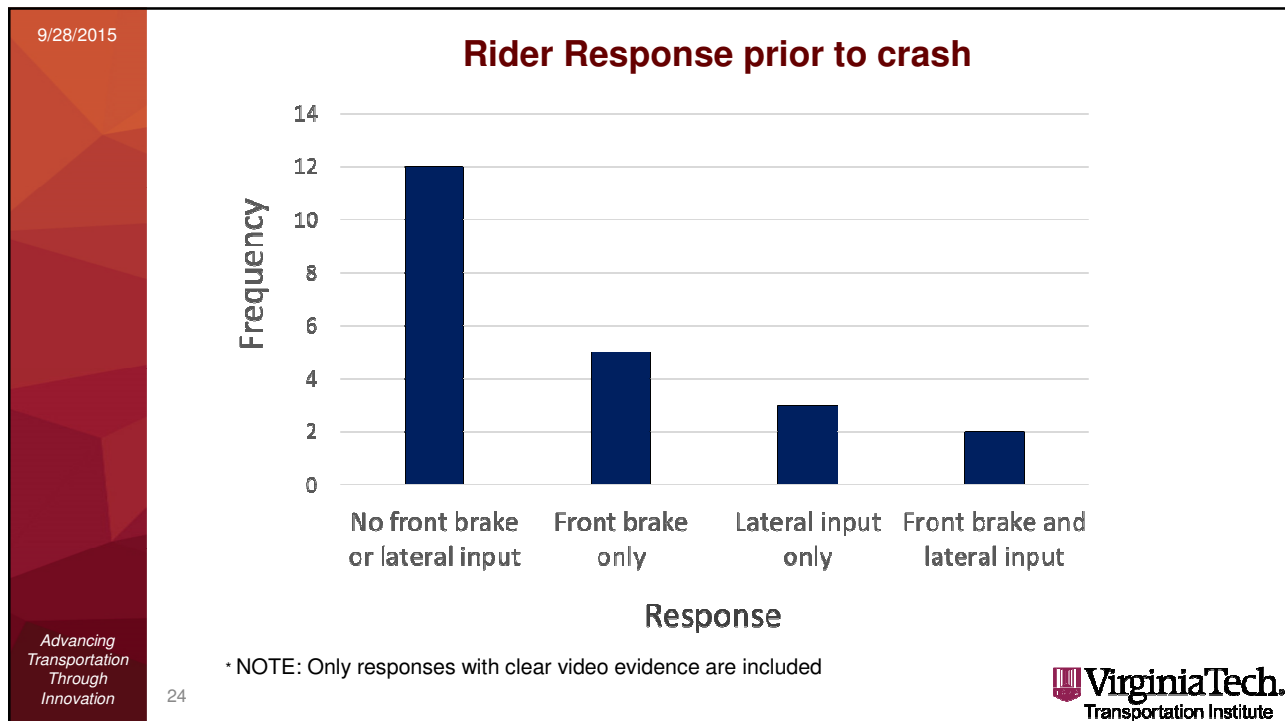
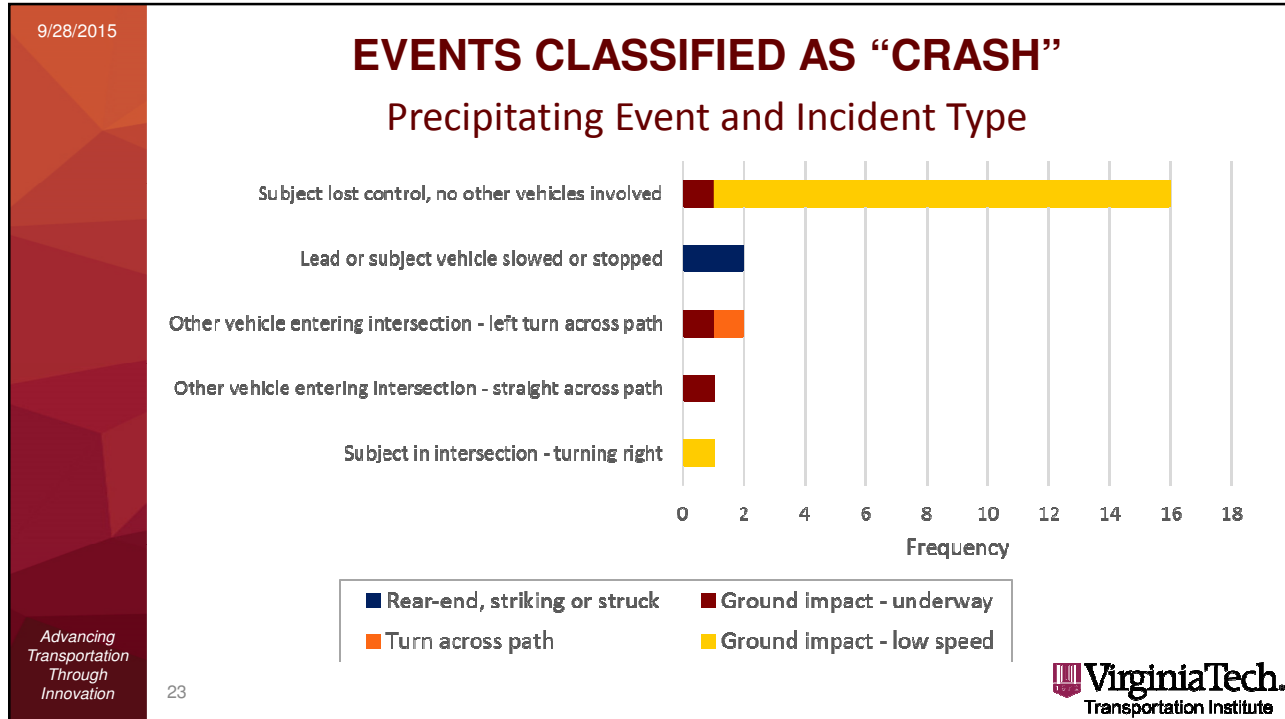
Analyses of Speed and Acceleration\Deceleration

- Maximum trip speeds, as expected were massed around 30 and 60 mph
 - Range < 5mph to 150+
- Observed 95th percentile accelerations (0.4g) are stronger than 95th percentile decelerations (-0.32g)
- There seems to be a trend for riders to brake harder as experience increases (at least among sport bike riders).

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PRELIMINARY CRASH ANALYSIS

- Out of >38,000 trips, preliminary analysis discovered 22 “crashes”
- 18% of 100 riders experienced at least one crash
- Each location, age group, gender, and bike class were represented
- Majority of crashes (16 of 22) were low-speed ground impact
- MSF is currently sponsoring a full crash and near crash investigation of over the 38,000 trips, 350,000 miles, and 100 years worth of riding in the MSF 100 Dataset.



Summary

- Average Rider rides approximately 4,300 miles per year.
- Riders tend to ride when the weather is nice, and when the weather is nice riders will ride
- Early investigations reveal few statistical differences between personalities or reported risky behaviors of riders of differing bike types.
- Riders tend to accelerate at a higher rate than they decelerate
- 22 Crashes discovered so far
 - MSF Sponsoring full Crash and Near Crash Analysis of the data



Questions and Contact Information

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