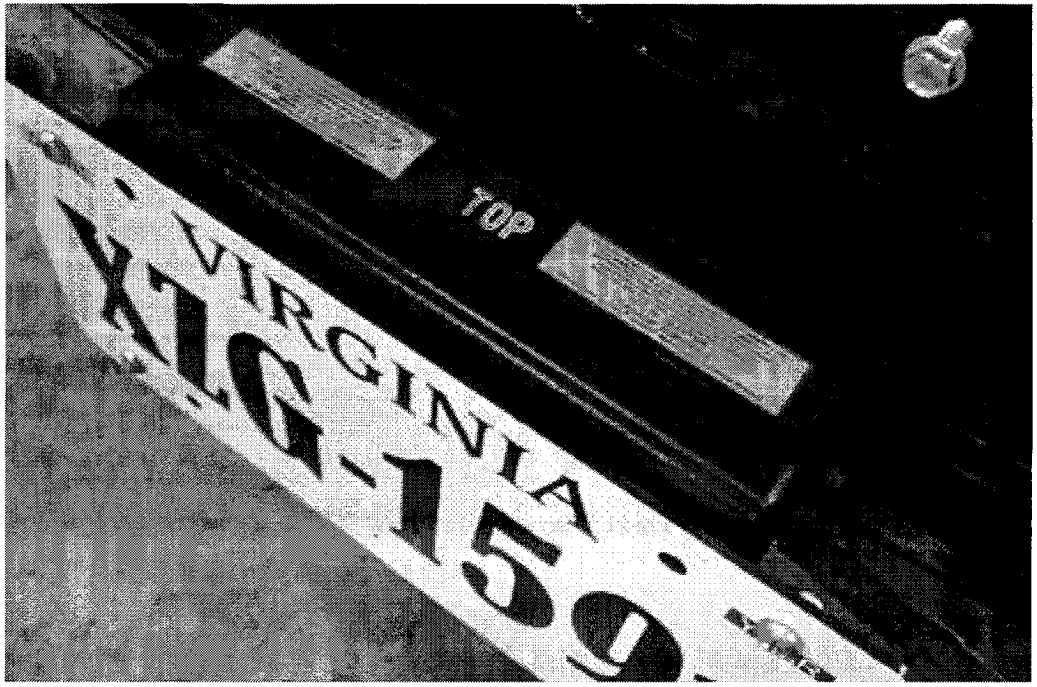
Summary Opinion: A Naturalistic Assessment of Driving Distraction



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100 Car "Naturalistic" Approach

- Data collection in a "naturalistic" setting to obtain crash/pre-crash/near-crash/conflict data as well as distributions of driver performance:
  - 241 drivers in their own (or leased) cars with specialized instrumentation, on public roads, as close to unobserved as possible.
  - Subjects use instrumented cars for an extended period (up to 13 months) without an experimenter present.
  - Subjects are not coached or instructed to perform any specific actions other than drive as they normally do.
  - Instrumentation is unobtrusive and inconspicuous to other drivers, but not invisible.

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Naturalistic Data Collection Approach

Highly capable instrumentation (well beyond EDRs)

- Five channels of digital, compressed video
- Four radar sensors front, rear (for all 100cars), and side (for 20 cars)
- Machine vision-based lane tracker
- Many other sensors: GPS, glare, RF, acceleration, yaw rate, controls, etc.
- Cell phone, wireless internet, or hardwire download
- Tie into vehicle network to obtain other sensor information
- Ruggedized, crash tested, all solid state
- Crash detection, Fault detection
- Remote Access

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What is the advantage of the "Naturalistic" approach for crash/near crash causation assessment?

- There is a critical lack of data specifically related to a primary cause of crashes:
  - "Driver Error" is a contributing factor in over 90% of vehicular crashes.
  - Reliable pre-crash information related to driver behavior is the most difficult to obtain.
- Naturalistic data provide detailed and valid knowledge of crash contributing factors: Specifically focusing on pre-crash events and driver behavior.

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Are the 100 car participants representative of the driving population?

- 241 total drivers; recruited from flyers and newspaper ads
- Ages 18-73
- Range of very "safe" to very "unsafe"
- Wide range of miles driven
- Commonly drove on all road classes
- Urban, suburban and a small amount of rural driving
- Both sedans and SUVs

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Caveats to the study:

- Extreme age groups missing (i.e., 16-17 and 75+)
- One location (metro DC/NoVA)
- Relatively little rural driving
- Fewer SUVs and light trucks than the national average
- Possible recruiting bias due to nature of the study

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To what degree did the presence of the instrumentation affect natural behavior?

- Answer: Immeasurably, after the first hour.
  - Numerous occurrences of extreme driving across the sample, including: Impairment, traffic violation, aggressive driving, "road rage."
  - Performance data (e.g., reaction time, speed selection) remained largely consistent with prior research and across the 13 months of data collection.
  - A few, isolated instances of "showing off" among younger drivers in the presence of other passengers was the only counter-indication.

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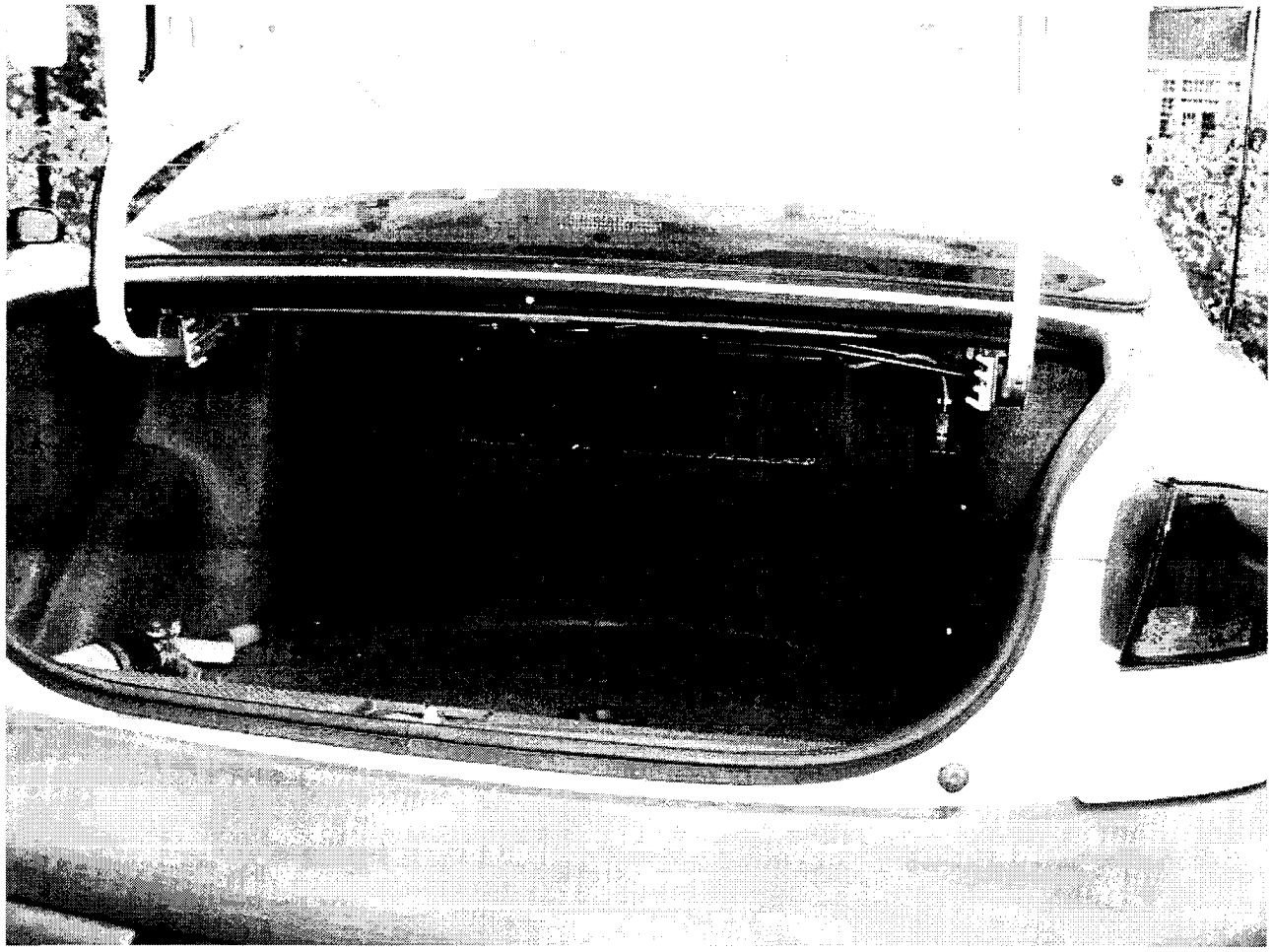
100 Car Instrumentation Mounted in Trunk



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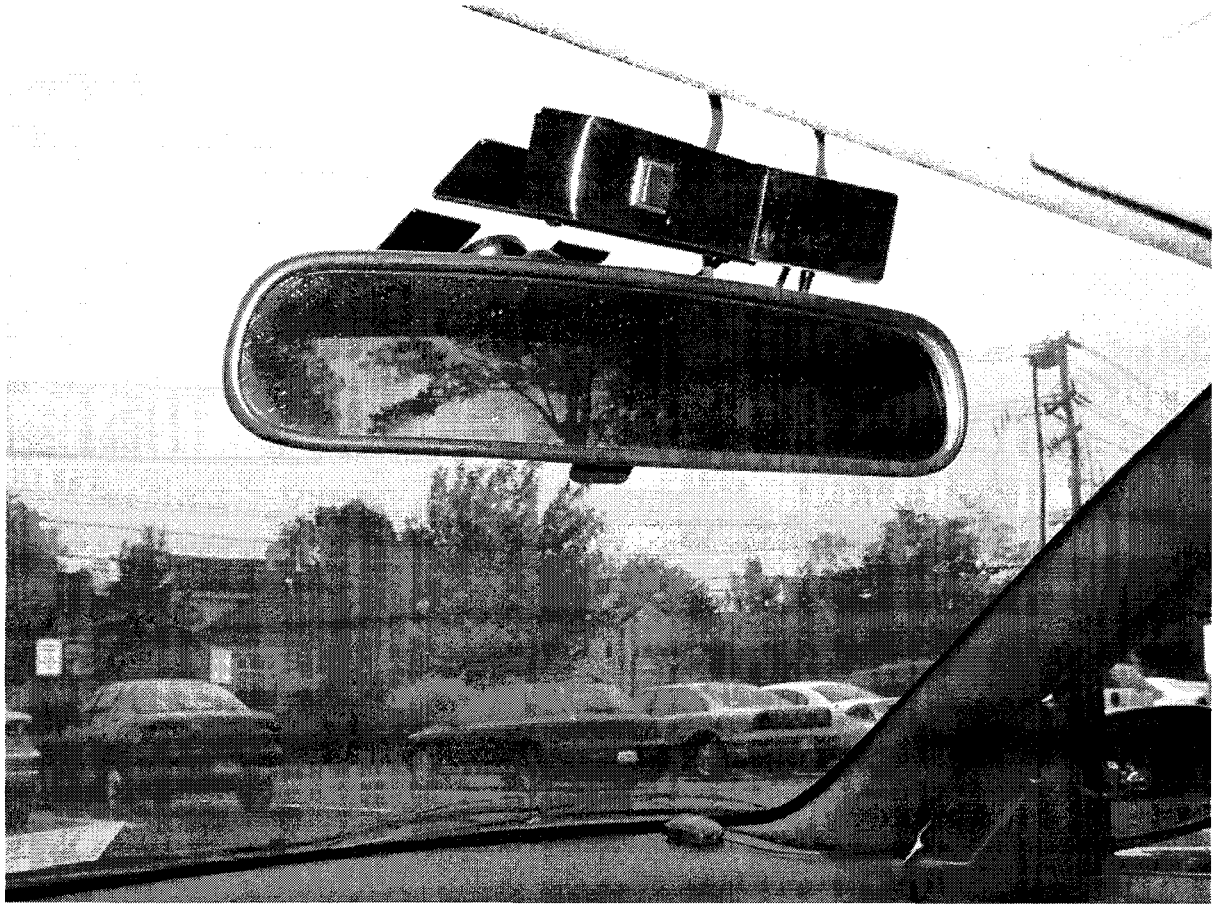
100 Car Face View Camera (behind smoked glass) and and Incident Push Button mounted above Rear View Mirror



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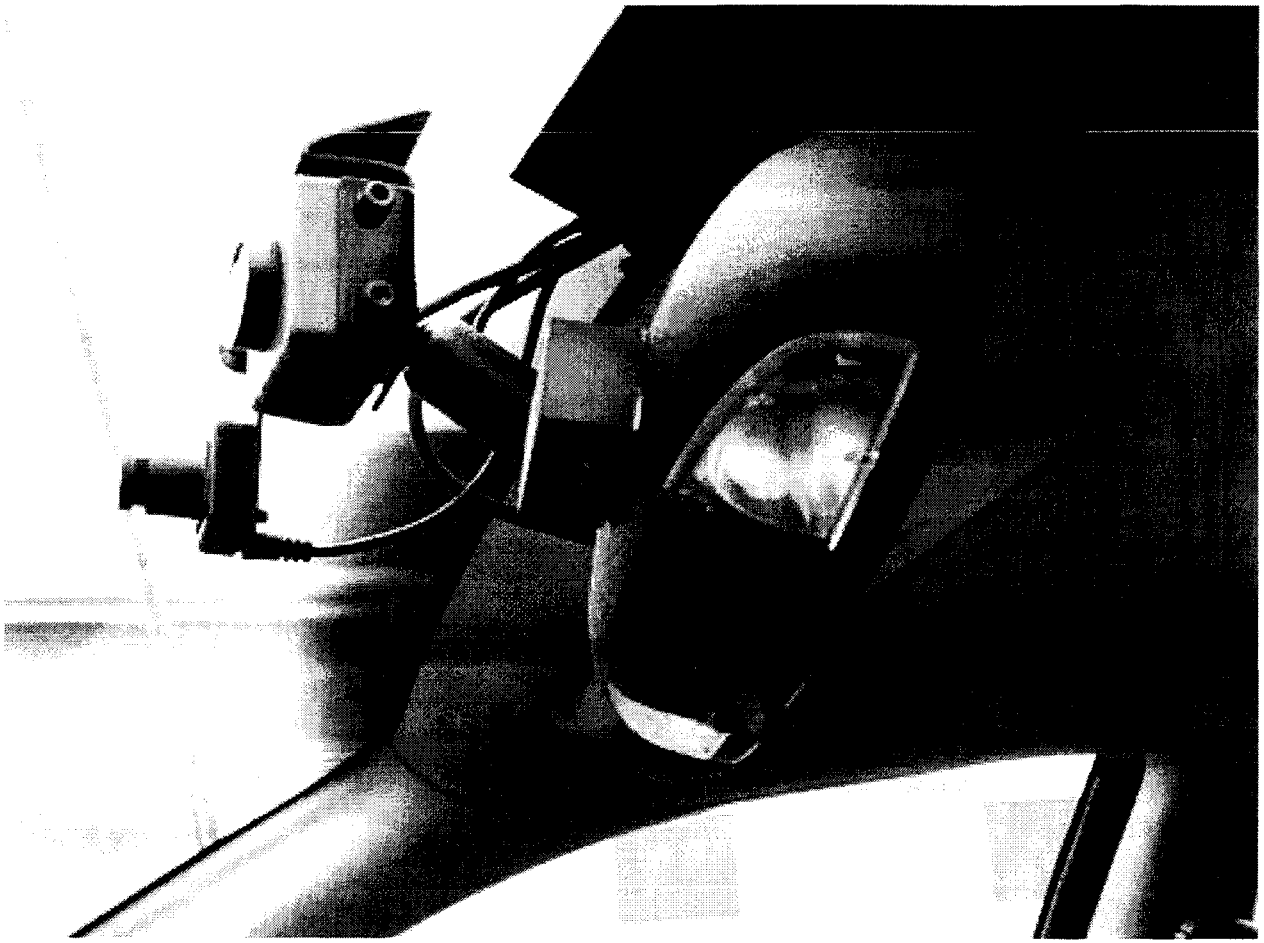
100 Car Forward Camera and Glare Sensor Mounted behind the Rear View Mirror



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The Naturalistic "100 Car" Study: Database Statistics

- 42,300 hours of driving data collected
- 82 Crashes and collisions (Data collected on 69)
  - Defined as any contact between the subject vehicle and another vehicle, fixed object, pedestrian pedalcyclist, animal.
- 761 Near crashes
  - Defined as a conflict situation requiring a rapid, severe evasive maneuver to avoid a crash.
- 20,000 'normal' driving epochs
  - 5000 with eye glance data

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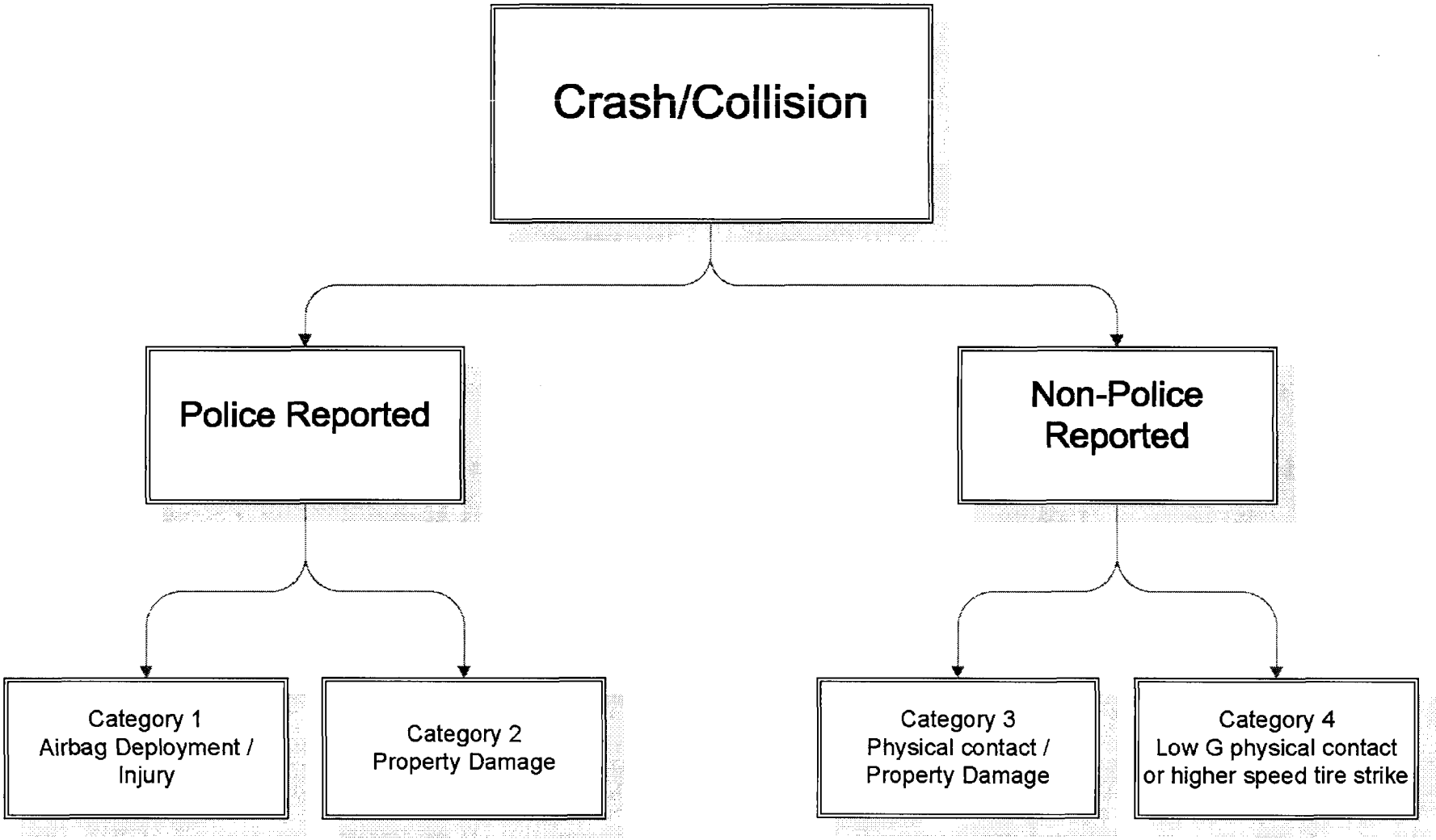
Crash/Collision Category Definitions



Collision Category 1 (Police-reported and/or contains an airbag or injury)	
Left Turn Against Path	1
Rear-End Struck	2
Run-Off-Road	2
Subtotal	5

Collision Category 2 (Police-reported with property damage only)	
Lane Change	1
Left Turn Against Path	1
Rear-End Struck	2
Rear-End Strike	5
Run-Off-Road	2
Subtotal	11

Collision Category 3 (Non-police-reported, physical contact/property damage)	
Backing	2
Object	4
Rear-End Strike	6
Rear-End Struck	6
Run-Off-Road	6
Sideswipe	1
Subtotal	25

Collision Category 4 (Non-police-reported, physical contact/no property damage)	
Animal	2
Backing	8
Object	1
Rear-End Strike	6
Rear-End Struck	4
Run-Off-Road	20
Subtotal	41

Total 82

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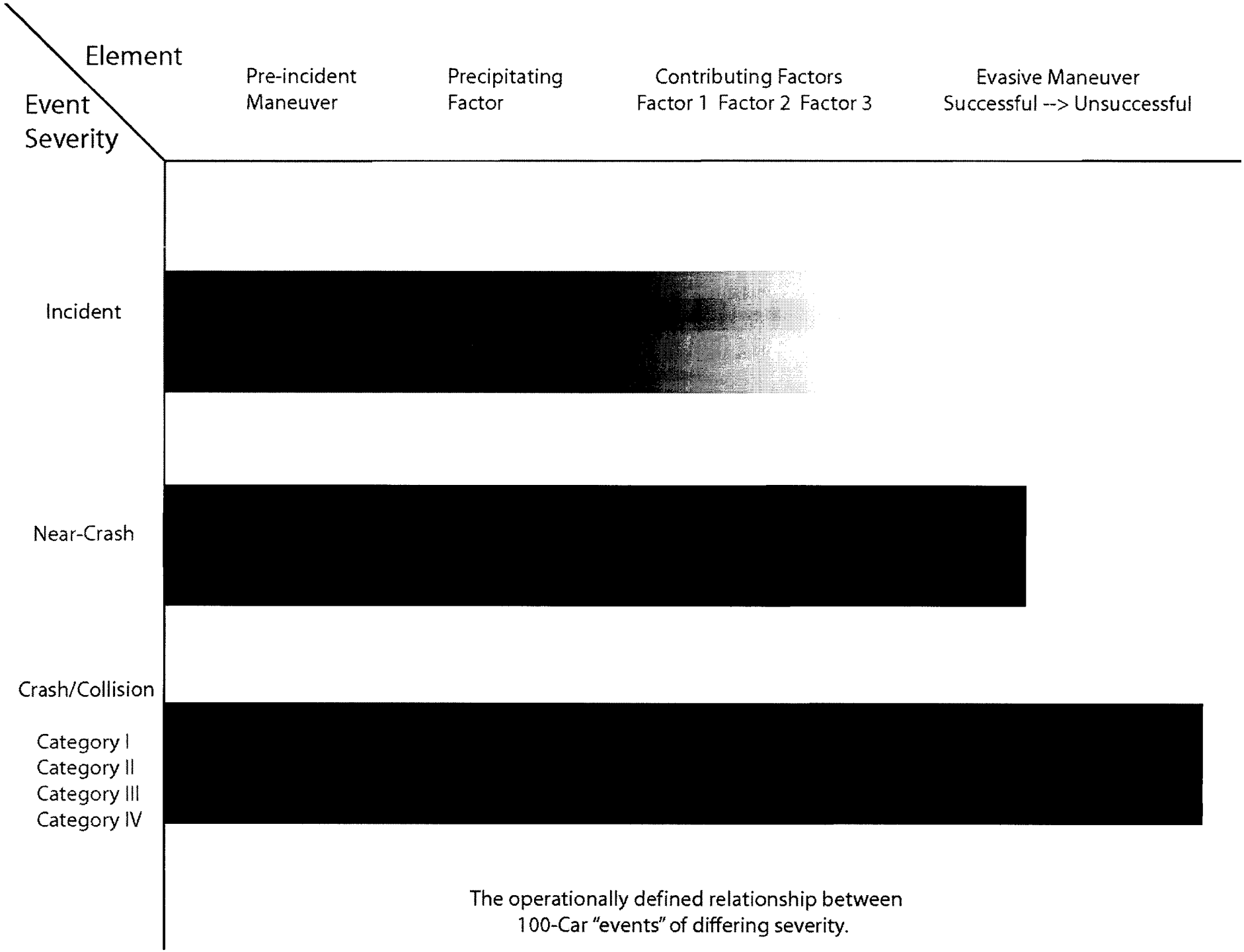

The operationally defined relationship between 100-Car "events" of differing severity.

100-Car Study Driver Inattention Results

Inattention to the forward roadway, which was operationally defined as including:

1) secondary task distraction,
2) driving-related inattention to the forward roadway (e.g., blind spot checks),
3) moderate to extreme fatigue,
4) other non-driving-related eye glances, is the primary contributing factor in most crashes and collisions,

was a major contributing factor to Crashes and Near-Crashes.

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Secondary Task Complexity Levels
(from Dingus, Antin, Hulse, & Wierwille, 1989).

- Complex Secondary Task: Multi-step, multiple eye glances away from the forward roadway, and/or multiple button presses.
- Moderate Complexity Tasks: At most two glances away from the roadway and/or at most two button presses.
- Simple Secondary Tasks: Zero or one button press and/or one glance away from the forward roadway.

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Summary Opinion

- Moderate and complex secondary tasks should be avoided while driving.
  - Includes manual dialing of hand-held phones, PDA use, and a number of other more conventional tasks.
  - Conversations on hand-held phones are not particularly risky on a one time basis, however they are so frequent that the total population risk is high.
  - It appears likely that a *true hands free phone* (i.e., simple secondary task: NOT headset, but single button press/voice activated) would not elevate the individual risk significantly above normal driving.
- Very young drivers need limits on their ability to perform secondary tasks while driving. This appear to be largely a judgment/confidence issue.