

Forensic Use of Electronic Event Data Recorders in Automotive Accident Litigation

**Presented April 2010 at the Davis and Young annual legal
update for their clients in Cleveland, Ohio**

Richard R. Ruth, P.E.

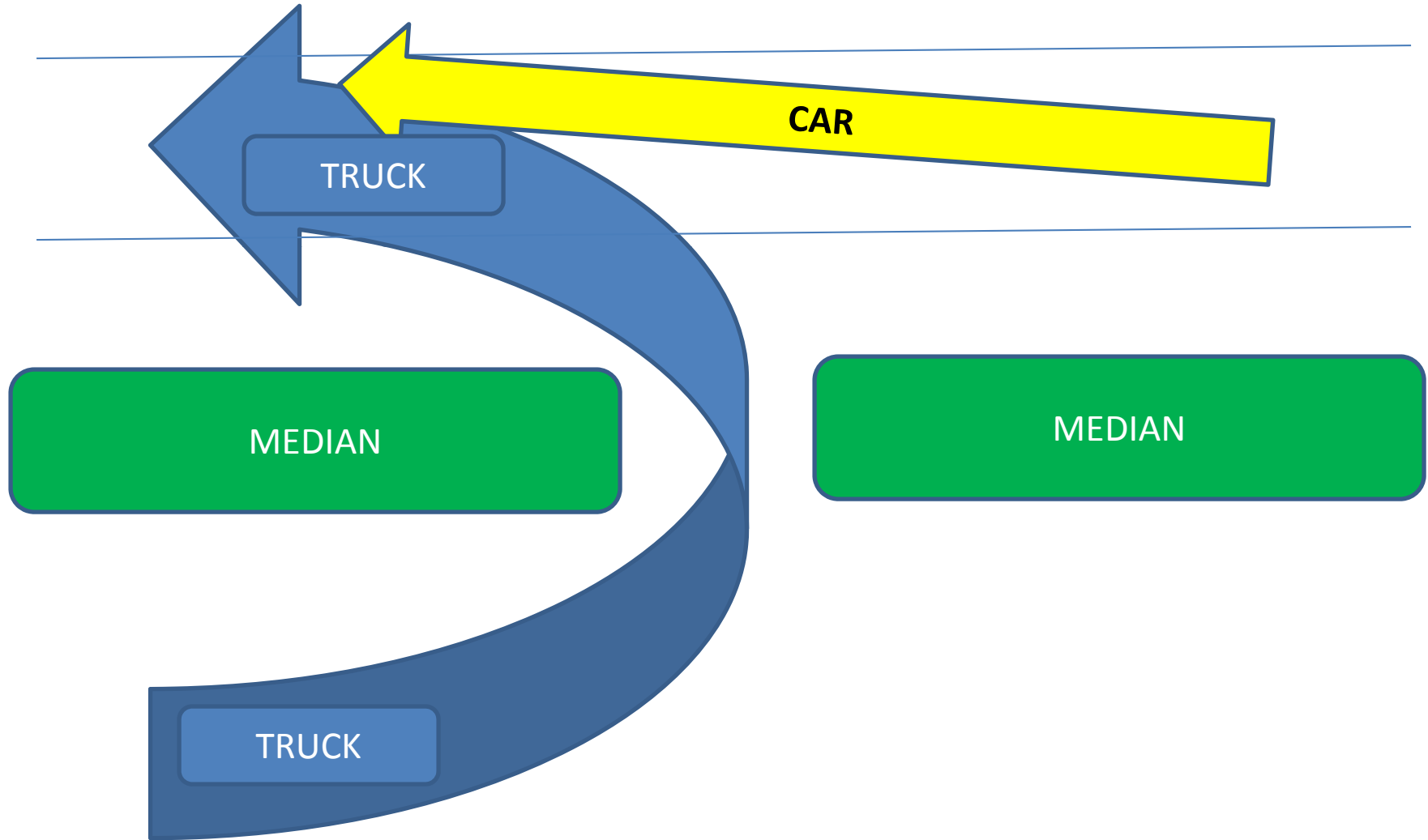
WHAT'S AN EDR?

- Something that records information about what happened just before and during a crash.
- Installed so auto manufacturer could see if safety devices performed properly
- In most newer cars and light trucks
- Part of Airbag and/or Engine Control Modules
- Conceptually similar to airplane “black boxes”, but NOT as sophisticated

What gets recorded?

- Early models = How hard crash was
- Later models = Speed, brake, throttle & more in seconds leading up to crash
- Front Driver, Some Passenger Seat Belt Use
- NOT an airplane “black box” – not dedicated, no voices
- New models have MUCH more data – steering angle, yaw rate, rollover information

TRUCK U-TURN - CAR HITS SIDE OF TRUCK





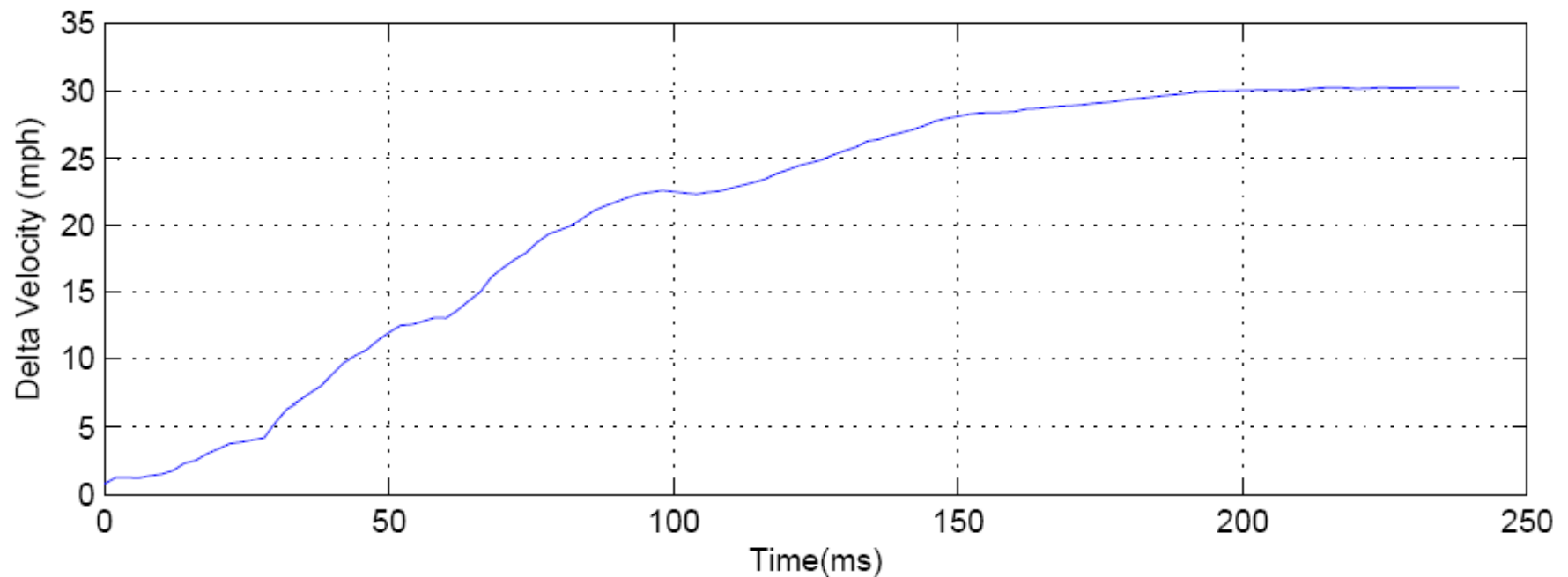
Reconstruction Inconclusive

- Car hits under trailer into right drive wheels of truck
- Difficult to use momentum or crush analysis to solve for precrash speeds
- No visible marks on road prior to impact, no way to say what happened before point of impact

Airbag Control Module Data

How Hard was the hit

Frontal Direction Only

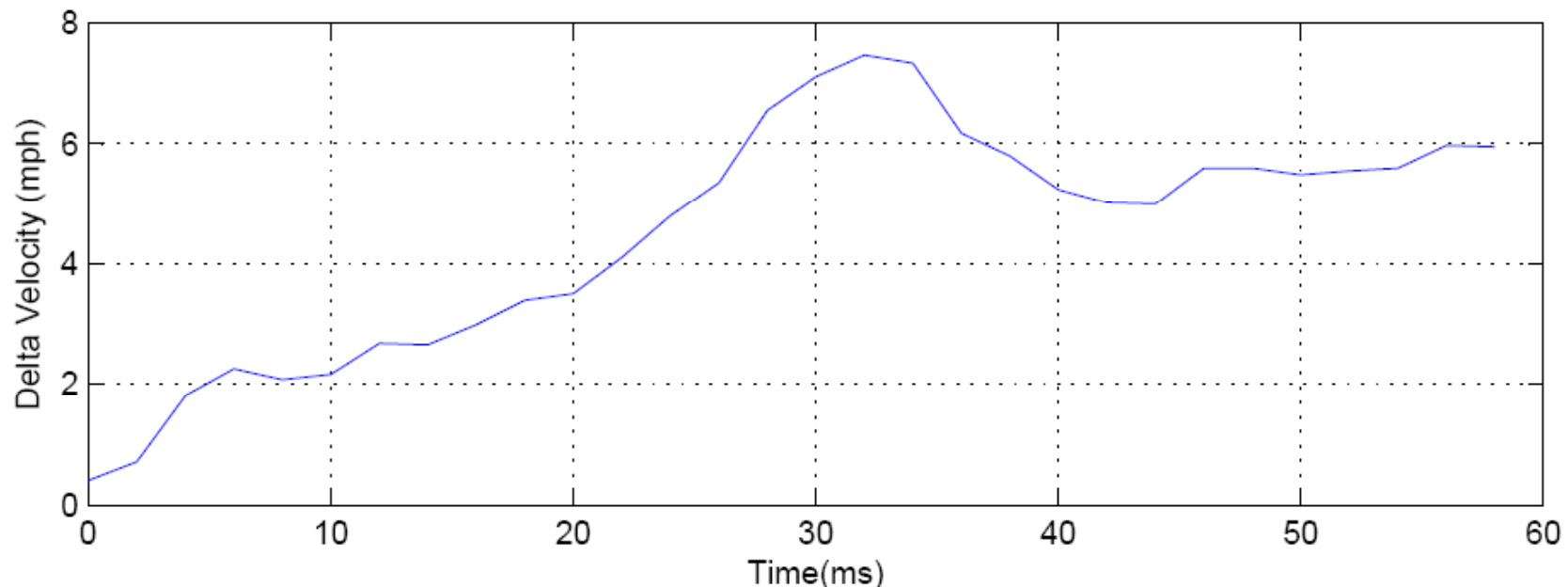


Car 70-30 change=truck 40? Or Car 50-30 change -= truck 20?

Airbag Control Module Data

How Hard was the hit

Side Direction Only



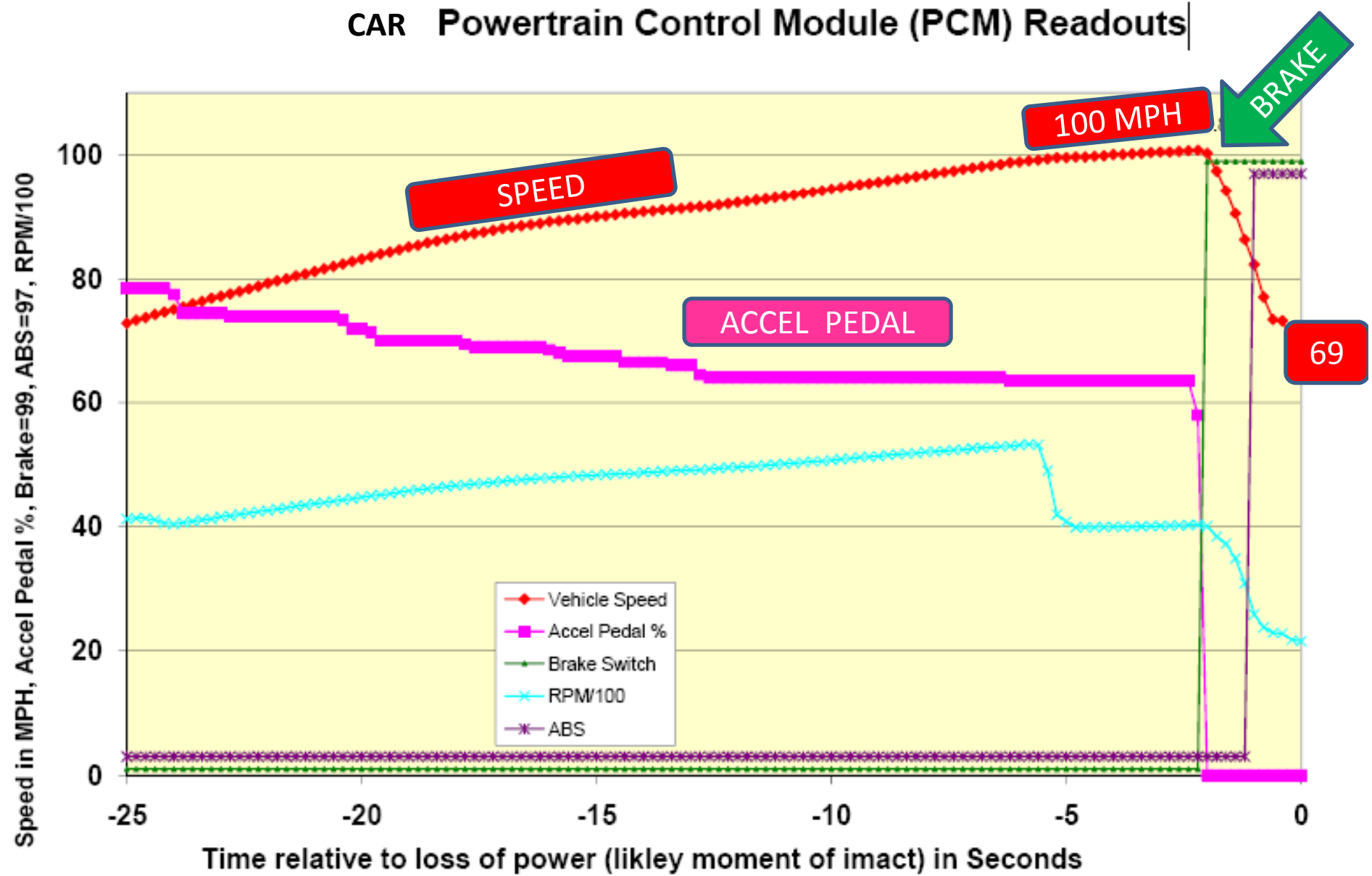
Small side component – mostly a frontal accident

Information In Airbag Module

SYSTEM STATUS AT THE START OF THE EVENT				
Location	Buckle Buckled/ Unbuckled	Seat Track (Forward/ Rearward)	Belt Minder Enabled (Yes/No)	Belt Minder Warning on Key-cycle (Yes/No)
DRIVER	Buckled	Rearward	Yes	Yes
PASSENGER	Unbuckled	n/a	Yes	
Diagnostic codes present at the start of the event: None				

PRE-CRASH DATA								
Time Before Event (seconds)	Vehicle Speed (mph)	Throttle Position (%)	Stability Control in Progress (Yes/No)	ABS in Progress (Yes/No)	TC Brake in Progress (Yes/No)	TC Engine in Progress (Yes/No)	Brake Depressed (Yes/No)	Passenger Occupant Classification (Occupied/Empty)
5	98	63.5	No	No	No	No	No	Empty
4	99	63.5	No	No	No	No	No	Empty
3	100	44	No	No	No	No	No	Empty
2	85	0	No	No	No	No	Yes	Empty
1	69	0	No	Yes	No	No	Yes	Empty

CAR Powertrain Control Module (PCM) Readouts



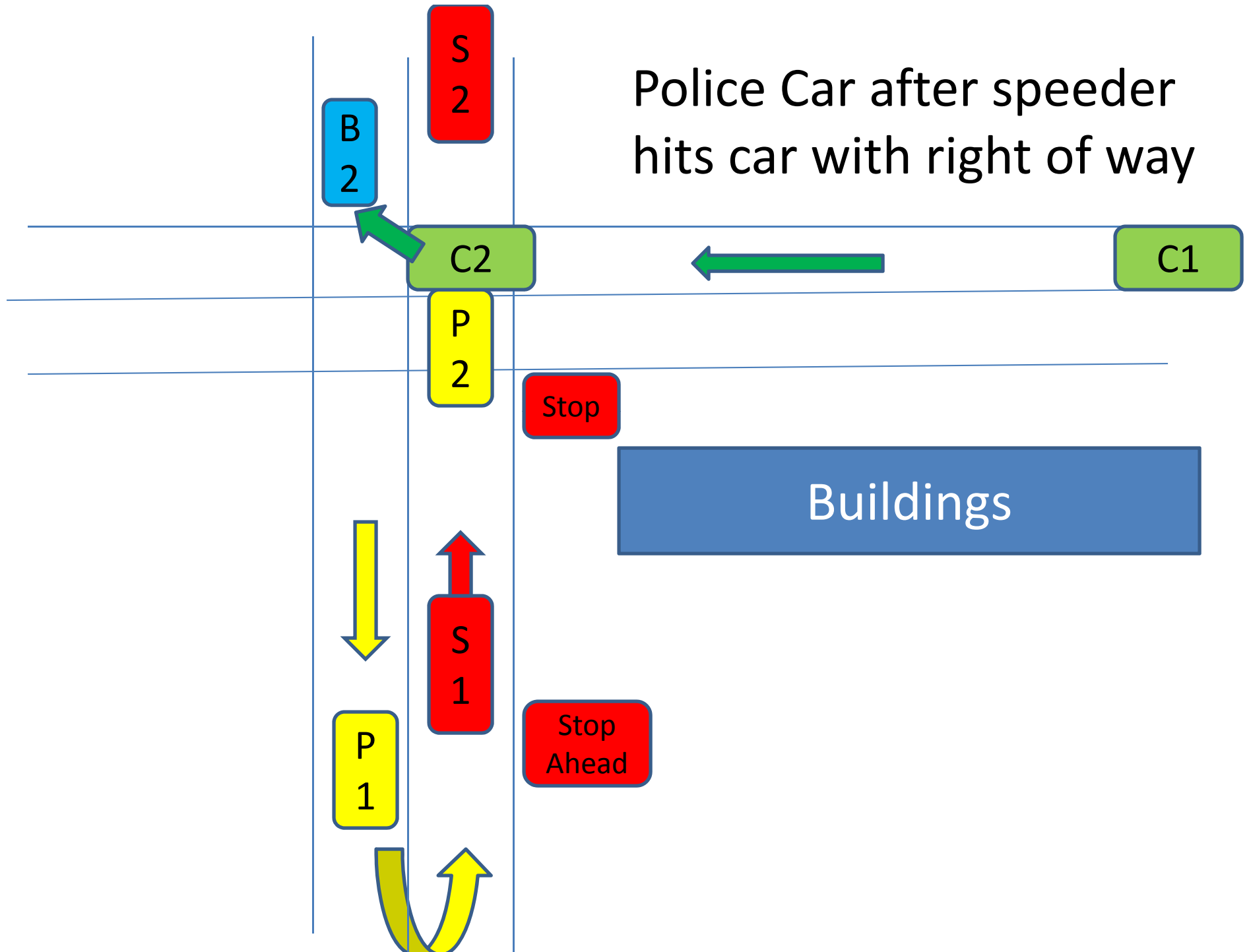
KEY EDR POINTS

- Conventional Reconstruction gets to a speed at impact most of the time
- ABS Brakes may leave few/no marks for reconstructionists to document– can't say they were going faster than speed at impact
- EDR shows not just speed – shows DRIVER BEHAVIOR prior to braking – intent to accelerate!
- EDR changed settlement value!!

Scenario 2 – Police Officer

- Speeder coming opposite direction from officer in residential area
- Officer turns around and begins to close gap, no lights or sirens yet per normal policy
- Speeder is believed to go through stop sign
- Officer approaches same stop sign
- Officer t-bones crossing vehicle resulting in fatality

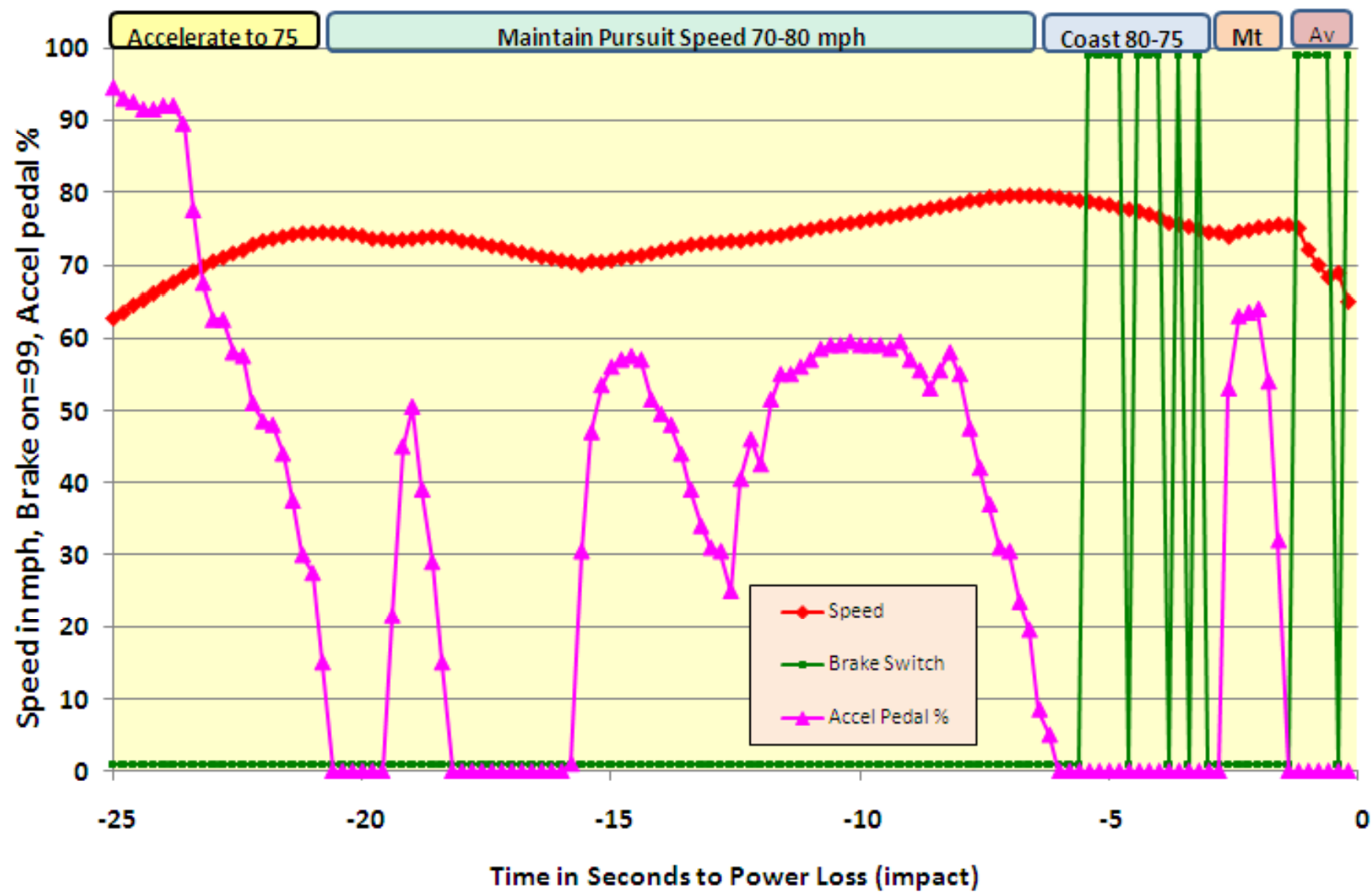
Police Car after speeder
hits car with right of way



Scene Evidence

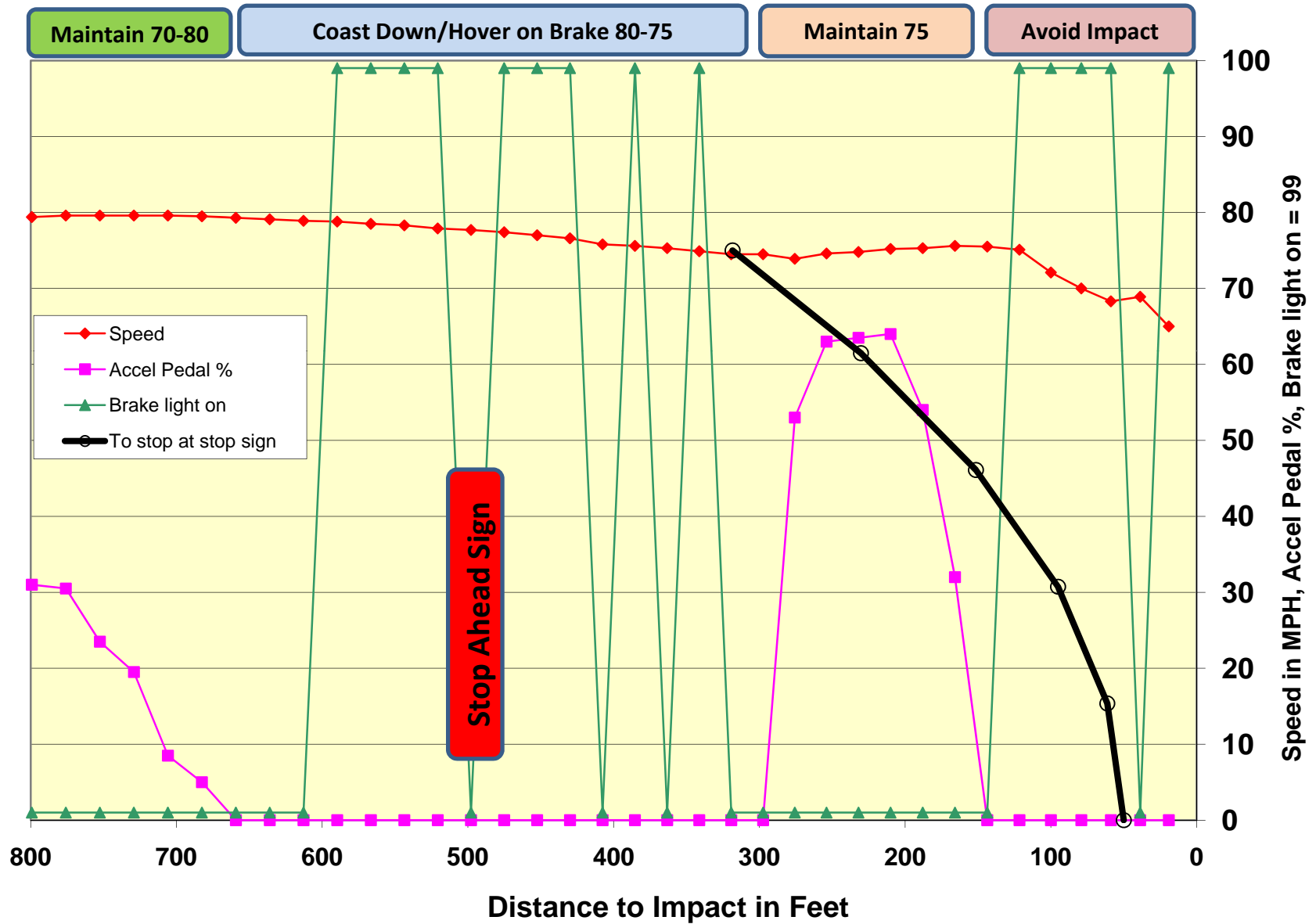
- Officer gives sworn statement he stopped for stop sign
- Damage to victim's driver door implies police car speed was significant
- As vehicles leave POI they contact a third vehicle, making it difficult to do a simple skid-to-stop calculation using drag factor from point of rest to point of impact
- Accident happens at night, by the time it gets light out no tire marks prior to impact are visible

Time Adjusted PCM Readouts





PCM Readouts vs. Distance to Impact Last 800 ft.



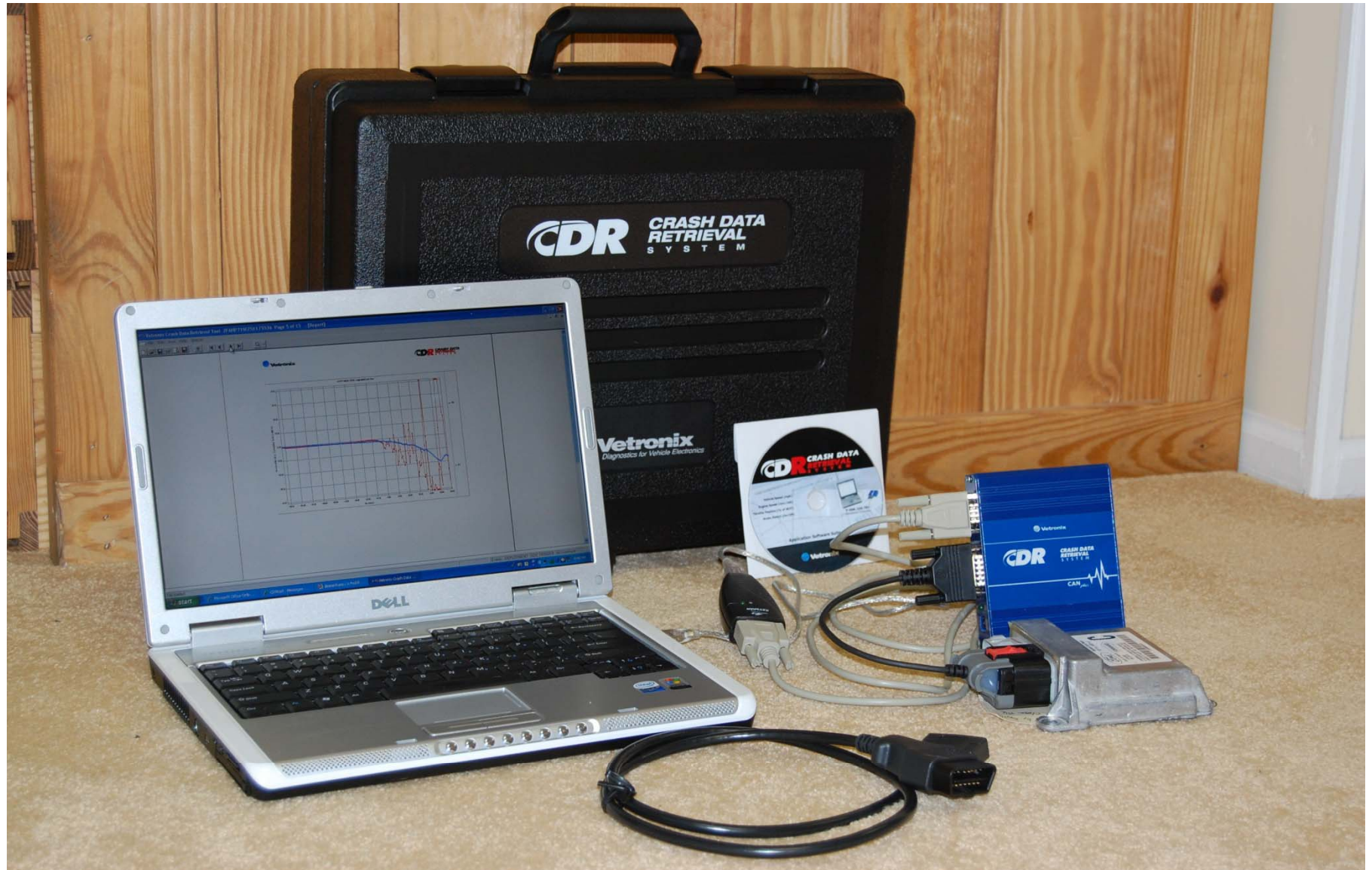
Power of the EDR

- **Speed before braking – reckless?**
- **Infer Driver Intent (goes to causation)**
 - Go as fast as possible
 - Go faster
 - Stay same speed
 - Coast to lower speed
 - Brake normally to lower speed
 - Brake as fast as possible
- **Show first reaction (accel pedal release)**
- **Show first brake application & braking rate**

Now that you are excited, what vehicles actually have EDR's that you can access?

Only 30-35% of vehicles on the road are accessible with publicly available tools – mostly GM, Ford and Chrysler vehicles are accessible TODAY

Bosch Crash Data Retrieval System



Chrysler CDR Coverage 3.4

Chrysler CDR 3.4 Coverage Jan. 2010

(North American Only listed)

Last 3 digits of Bosch CDR cable number shown			2005	2006	2007	2008	2009	2010
Chrysler	300	Center stack		228 ^{3,5}	228 ⁵	228	228	228
Chrysler	Aspen	Console, aft			226 ⁴	226	226	
Chrysler	Pacifica	Center stack			228 ⁵	228 ⁵		
Chrysler	PT Cruiser	Console, fwd			228 ^{5,7}	228 ⁵	228	228
Chrysler	Sebring	Varies			226 ⁴	226	226	516 ⁸
Chrysler	Town & Country	Center stack				385 ⁶	385	
Dodge	Avenger	Varies				226	226	516 ⁸
Dodge	Caliber	Varies			226 ⁴	226	226	516 ⁸
Dodge	Caravan	Center stack				385 ⁶	385	
Dodge	Challenger	Center stack				228	228	228
Dodge	Charger	Center stack		228 ^{3,5}	228 ⁵	228	228	228
Dodge	Dakota	Center stack			228 ⁵	228	228	228
Dodge	Durango	Console, aft	226 ^{2,4}	226 ^{2,4}	226 ^{2,4}	226 ²	226 ²	
Dodge	Journey	Console, fwd					385	
Dodge	Magnum	Center stack		228 ^{3,5}	228 ⁵	228		
Dodge	Nitro	Varies			227 ⁴	227	227	516 ⁸
Dodge	Ram Cab Chassis	Console, aft		226 ⁴	226 ⁴	226 ⁴	226 ⁴	453 ⁸
Dodge	Ram Pickup (25-5500)	Console, aft of		226 ⁴	226 ⁴	226 ⁴	226	453 ⁸
Dodge	Ram Pickup (1500)	Varies		226 ⁴	226 ⁴	226	453 ⁶	453 ⁶
Jeep	Commander	Console, aft		228 ^{3,5}	228 ⁵	228	228	228
Jeep	Compass	Center stack			226 ⁴	226	226	516 ⁸
Jeep	Grand Cherokee	Console, aft of		228 ^{3,5}	228 ⁵	228	228	228
Jeep	Liberty/Cherokee	Varies				227	227	516 ⁸
Jeep	Patriot	Center stack			226 ⁴	226	226	516 ⁸
Jeep	Wrangler	Console, aft of			227 ⁴	227	227	

The source data for this chart is the Bosch CDR help file for Version 3.4 as of January 2010 & Chrysler

Always consult the latest help file for the most accurate coverage

Superscripts defined:

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Ford CDR Coverage 3.4

Model Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Econoline	No	No	No	No	PCM **	PCM **	PCM **	No	RCM	RCM
Escape/Mariner Gas	RCM	RCM	RCM	RCM	No	No	No	No	RCM	RCM
Escape/Mariner Hybrid					No	No	No	No	RCM	RCM
F150	RCM	RCM	RCM	PCM	PCM	PCM	PCM	PCM	RCM	RCM
Mark LT						PCM	No	No		
Expedition	RCM	RCM	No	No	PCM	PCM	PCM***	No	No	No
Navigator	RCM	RCM	No	No	PCM	PCM	PCM***	No	No	No
Ranger	RCM	RCM	RCM	RCM	RCM	RCM	No	No	No	RCM
Super Duty F250+	RCM	RCM	RCM	RCM	RCM/PCM**	RCM/PCM**	PCM**	No	No	No
Excursion	RCM	RCM	RCM	RCM	RCM					
Explorer/Mountaineer	No Useful Data	No	No	PCM	PCM	PCM/RCM	PCM/RCM	RCM	No	No
Aviator			No	No	No		PCM			
Explorer Sport (2 dr)	RCM	RCM	No							
Sport Trac (pickup bed)	RCM	RCM	No	No	No		PCM/RCM	RCM	No	No
Windstar/Freestar/Monterey	RCM	RCM	RCM	No	No	No	No			
LS	RCM	RCM	PCM	PCM	PCM	PCM				
Escort/ZX2	RCM	RCM	RCM							
Focus	No Useful Data	No Useful Data	No Useful Data	No Useful Data	No	No	No	RCM	RCM	RCM
Mustang	RCM	RCM	RCM	RCM	PCM	PCM	PCM	No	No	RCM
T-bird	RCM	RCM	RCM/PCM	RCM/PCM	RCM/PCM					
Taurus/Sable (no Sable '10)	RCM	No	No	No	No	No		No	No	RCM
500/Montego/Freestyle					PCM	PCM	PCM			
Fusion/Milan/Zephyr 06/MKZ 07+						PCM/RCM	PCM/RCM	No	No	RCM
Crown Vic/Grand Marquis	RCM	RCM	RCM	RCM	PCM/RCM	PCM/RCM	PCM/RCM	PCM/RCM	PCM/RCM	PCM/RCM
Town Car	RCM	RCM	RCM	RCM	PCM/RCM	PCM/RCM	PCM/RCM	PCM/RCM	PCM/RCM	PCM/RCM
Edge/MKX							PCM/RCM	PCM/RCM	PCM/RCM	PCM/RCM
Continental	RCM	RCM								
Cougar	NO	NO								
Flex/MKT '10									No	RCM
MKS										RCM

** = Gasoline Engine Only, Not Diesel

*** Not all models are covered

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Chevrolet Event Data Recorder Information Availability
Bosch CDR Cable Number listed indicates coverage

Make		Model		crash Data & 150ms Longitudinal Delta V					Blue = Precrash Data & 300ms XY Delta V									
				000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010				
Chevrolet	Astro			2829	2829	2829	2829	2829	2829	3003	3003	3320 ROS	3320 ROS	3320 ROS	454			
					2829	3003	3003	3003	3003			3320		3320				
Chevrolet	Avalanche			2829	2829	2829	2829	2829	2829*									
		388	2888															
Chevrolet	Aveo			2829											454			
		2829	2829	2829														
Chevrolet	Blazer			2829	2829	2829	2829	2829	2829				3320					
										3321	3321	3321	3321	3321	3321			
Chevrolet	C/K pickup									3003	3003	3003	3003	3003	3003			
		2829	2829	2829	2829	2829	2829	3003	3003	3003	3003	3003	3003	3003	3003			
Chevrolet	Camaro									2829					454			
										3004	3004	3320 ROS	3320 ROS	3320 ROS	454			
Chevrolet	Caprice			388	2829	2829	3003	3003	3003	3003	3003	3003	3320 ROS	3320 ROS	3320 ROS			
											3321	3321	3321	3321	3321			
Chevrolet	Impala		3002	3002				2829	2829	2829	2829	2829	3320	3320	3320			
Chevrolet	Kodiak							2829	2829	2829	2829	2829	2829	2829				
Chevrolet	Lumina		3002	3002	2888	2888	- 2888	2888	2888									
Chevrolet	Malibu				2888	2888	- 2888	2829	2829	2829	2829	3321	3321	3321	3321			
Chevrolet	Metro		3002	DLC	DLC	DLC	- DLC	DLC	DLC									
Chevrolet	Monte Carlo		3002	3002	2888	2888	- 2888	2829	2829	2829	2829	2829	3320	3320				
Chevrolet	S10					2888	- 2888	2829	2829	2829	2829							
Chevrolet	S10 Electric					2888	- 2888											
Chevrolet	Silverado				2888	2888	- 2888	MIX	2829	2829	3003	3003	3003	3003	3003			
Chevrolet	SSR								3003	3003	3003	3003						
Chevrolet	Suburban				2888	2888	- 2888	MIX	2829	2829	3003	3003	3003	3003	3003			
Chevrolet	Tahoe				2888	2888	- 2888	MIX	2829	2829	3003	3003	3003	3003	3003			
Chevrolet	Tracker		DLC	DLC	DLC	DLC	- DLC	DLC	DLC	DLC	DLC							
Chevrolet	TrailBlazer							2829	2829	2829	3293	3293	3293	3293				
Chevrolet	Traverse													3320 ROS	454			
Chevrolet	Uplander										3004	3293 w/AW9	3293 w/AW9	3293 w/AW9				
Chevrolet	Venture			DLC	DLC	DLC	- DLC	2829	2829	3004	3004	3004	3004					
		14%	48%	76%	94%	100%	20%	74%	86%	96%	98%	100%	14%	43%	71%	79%	82%	91%
APPROXIMATE PHASE IN		Delta V	Delta V	Delta V	Delta V	Delta V	Pre-Crash	Pre-crash	Pre-crash	Pre-Crash	Pre-Crash	Pre-Crash	Pre + XY	Pre + XY	Pre + XY	Pre + XY	Pre + XY	Pre + XY

The 92-99 data on this page is taken from the Bosch CDR 2.2 data file and may be supplemented by other sources. Copyright 2010 11 PM - UNF

GM Rollover Sensor Phase In

GM Rollover Sensor Coverage Bosch CDR					
Green shading = will read ROS data IF VEHICLED IS EQUIPPED with ROS					
Model	Location	2007	2008	2009	2010
BUICK					
Enclave	Center Tunnel		455	455	In SDM
CADILLAC					
Escalade	Center Tunnel	455	455	455	In SDM
SRX	Center Tunnel	455	455	455	
CHEVROLET					
Avalanche	Center Tunnel	455	455	455	In SDM
Captiva	Center Tunnel				455
Equinox	Center Tunnel	455	455	455	In SDM
Express			455	455	455
Silverado	Center Tunnel	455	455	455	In SDM
Suburban	Center Tunnel	455	455	455	In SDM
Tahoe	Center Tunnel	455	455	455	In SDM
Traverse	Center Tunnel			455	In SDM
GMC					
Acadia	Center Tunnel	455	455	455	In SDM
Savanna	Center Tunnel		455	455	455
Sierra	Center Tunnel	455	455	455	In SDM
Yukon	Center Tunnel	455	455	455	In SDM
HUMMER					
H2	Center Tunnel		455	455	455
PONTIAC					
Torrent	Center Tunnel	455	455	455	
SATURN					
Outlook	Center Tunnel	455	455	455	In SDM
Vue	Center Tunnel		455	455	455

Other Manufacturers

- Many other manufactures have EDR's but do not make the data publicly available at this time.
- Some will assist law enforcement but not civil litigants
- You must ask each company if they will co-operate

Federal EDR Standardization: Part 563

- Does not REQUIRE EDR's, but sets minimum standards for those vehicles so equipped
- Minimum standard includes most things you need – speed/brake/throttle for 5 seconds at 0.5 second intervals, belt use, Crash severity, info to identify data is from your crash
- Also standardizes content for most other things manufacturers record
- The vast majority of mfr's will incorporate a standardized EDR

Part 563 Requirements

- All cars and light trucks comply by Sept. 2012
- Data must be accessible by a publicly available tool
- Tool must be released in timely fashion
- Recorders must capture events even if power is lost during crash
- Recorder must capture multiple events
- Recorder has telltales to tie data to your crash

Decisions: Who to send to get data?

- “Technicians” who can access the data but may not understand how to interpret it.
- “Analysts” who know both how to get it and how to interpret it.
- Some choose to have many lower cost gathers, fewer analysts to review the files.
- Spoliation concerns

Legal Hurdles: State Access Laws

- AR, CA, CO, CN, MN, NH, NY, NV, ND, OR, TX, VA
- WA (eff July 2010)
- Generally require owner permission or sufficient legal authority prior to accessing EDR
- Suggest including EDR clause in standard Duty-to-Cooperate forms
- Improper Data Access could trigger criminal sanctions, claims of unfair or deceptive practices

Do EVERY case vs “Selected” cases

- Frontal, Side, Rear, or Rollover crash?
- Is the data useful for your crash?
- Recommend only doing cases where it is expected to be useful.
- Insurance Service Office www.iso.com advises data available
- Duty to Investigate?? Duty to preserve evidence??

CAUTIONS:

- Adjusters need training in proper use of data
- Must insure that the EDR recording is from the crash you are investigating (sometimes it is an old crash due to power loss in new crash)
- Must check for presence of special circumstances that affect speed data (wheels locked, ABS braking, yaw, ice/snow)
- Must check for tire size vs. factory, vehicle equipment modifications

MORE CAUTIONS

- Some EDR's delete files after a month of normal driving – affects WHEN you access that data.
- The New Part 563 regulation will improve likelihood recording is from your crash. Older EDR's will still require careful evaluation.

Potential for EDR evidence spoliation

- EDR data *may* get “locked” after an airbag deployment.
- EDR data **MAY NOT** be “locked”, especially if an airbag does not deploy, and can be accidentally or deliberately overwritten.
- Many plaintiff experts are not yet knowledgeable on potential for EDR spoliation; they can accidentally erase data you need for your case.
- There is no known evidence of deliberate data spoliation yet in litigation, but it is theoretically possible that unscrupulous individuals could erase or overwrite data.

Data Admissibility

- EDR data is generally accepted in the courts, some parties request Frye or Daubert hearings, EDR has met these requirements when presented by a competent expert.
- Only known exclusions were for no or bad experts, improper data preservation, file not from crash of interest – never because it is not reliable.

FRAUD INVESTIGATIONS

- EDR can sometimes help easily identify staged collisions and false stories by claimant
- “I hit black ice” – did they?
Speed trace will show it.
- “I was run off the road” –
Steering angle inputs will it

Example Cases

Fraud: Staged Collision

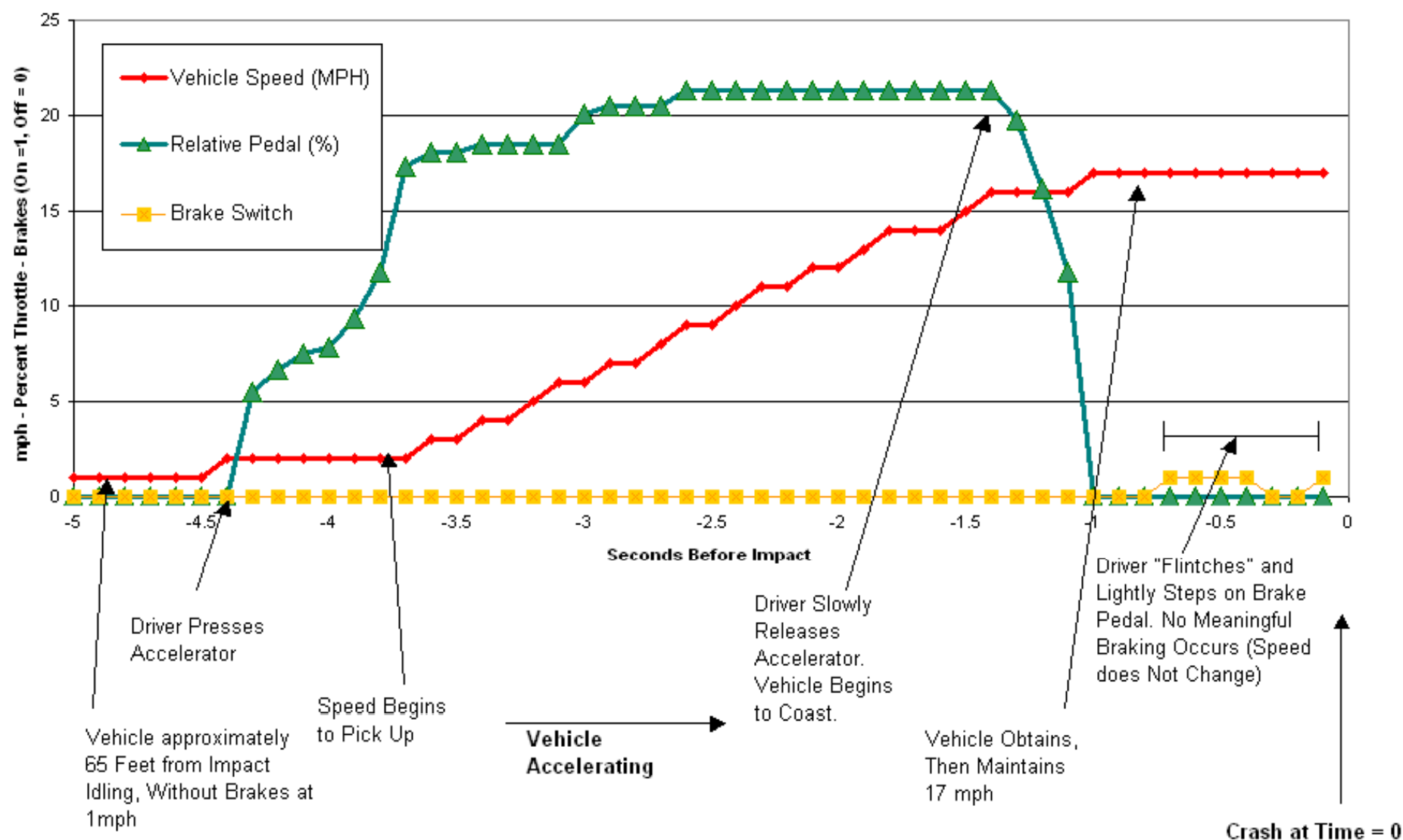
- Vehicle Involved in Staged Collision
- EDR Evidence
 - Not Consistent with Reported Accident



“I was minding my own business going 30 mph when this car pulled out in front of me. I slammed on my brake but couldn’t avoid...”

Example Cases Fraud: Staged Collision

Five Seconds of PreCrash Data



Summary

- EDR is a powerful objective witness
- EDR data gets better every year, new part 563 rule will make it better yet for Sept. 2012
- Only accessible in 30-35% of vehicles NOW
- Strength is giving pre-braking speeds and inferring driver INTENT prior to accident and if reaction to hazard was appropriate
- Many logistics and details to work out to implement an EDR harvesting plan

Contact Information

- Richard Ruth – ruthconsulting@comcast.net
313 910 5809
www.ruthconsulting.com