ACCIDENTS HAPPEN

James D. Whelan, P.E.

Steven Stanaszak

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Outline for Today

- The Call
- Accident Scene
- Heavy Trucks - Brakes
- Preservation
- Heavy Trucks - EDR
- Passenger Vehicles
- Document Collection
- Coordinated Loss Investigation Team

Symbols

- Adjuster 
- Attorney 
- Engineer 

The Call

The Call

- **Privilege**
- Where is the accident?
- Google – Location & News
  - Roadway configuration?
  - Serious accident?
  - What are the weather conditions?
- Has the driver been secured?
- Has an engineer been retained?
- Is there an adjuster already on the scene?

Experts

- **Privilege**
- **Accident Recon**
- **Biomechanical**
- **Conspicuity**

Accident Scene

What to Document?

- Roadway layout
- Pedestrian walkways
- Traffic signals
- Lighting condition
- Road surface
- Signs (posted speed limit signs, stop signs, and other non-accident related markings)
- Gouges and grooves
- Tire marks
- Fluid stains
- Debris

At the Accident Scene

At the Accident Scene

At the Accident Scene

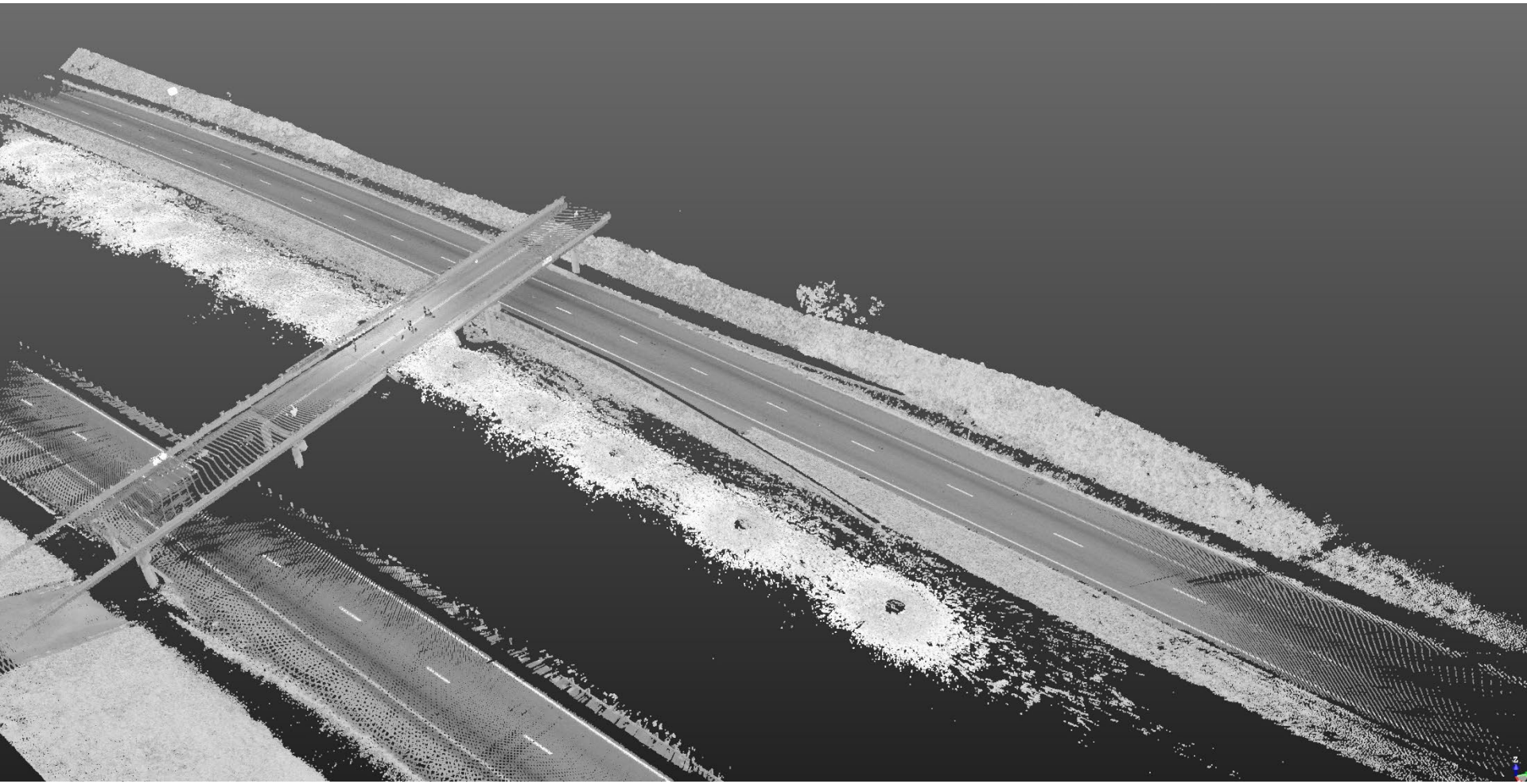
At the Accident Scene

At the Accident Scene

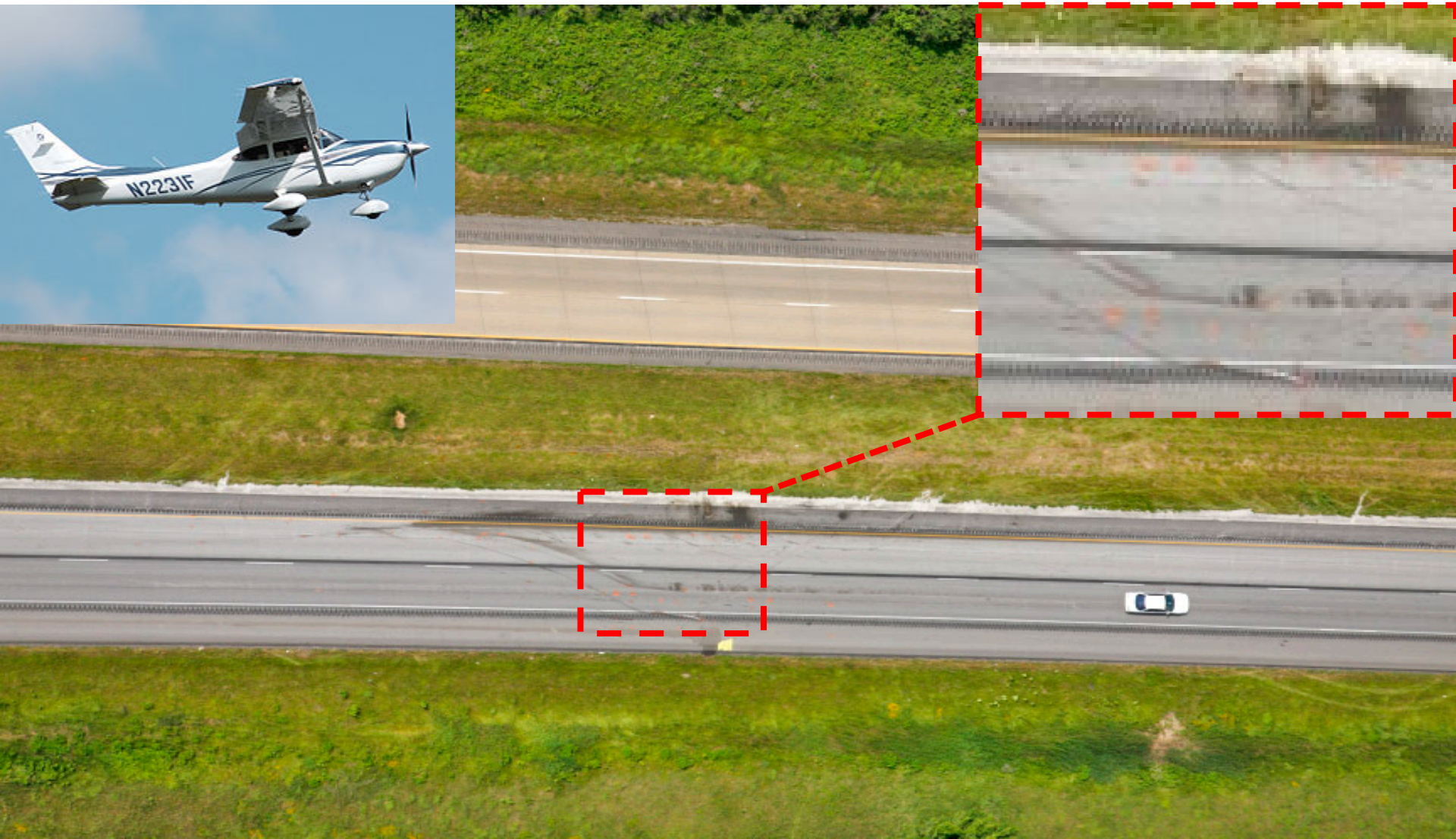
Document the Roadway

Document the Roadway

Document the Roadway



Document the Roadway



Heavy Trucks

Inspection Procedures

STEP 1: Left side of Cab Area
- *Note general condition*
- *Left front wheel*
  - Condition of wheel
  - Condition of tires
- *Left front suspension*
- *Left front brake*
  - brake drum
  - hoses
  - air chamber mounting
  - check slack adjusters

STEP 2: Front of Cab Area
- *Condition of front axle*
- *Condition of steering system*
- *Condition of windshield*
- *Lights and reflectors*

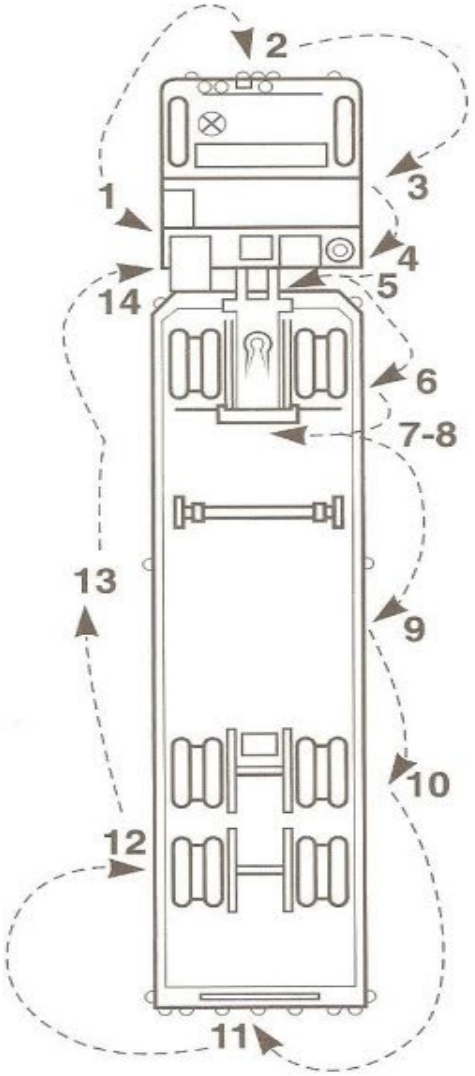
STEP 3: Right Side of Cab Area
- *Check all items as done on left side of cab area*

STEP 4: Right Saddle Tank Area
- *Right fuel tank(s)*
- *Condition of visible parts*

STEP 5: Trailer Frontal Area
- *Air and electrical connections*
  - Glad hands properly mounted, free of damage, not leaking
- *Lights and reflectors*

STEP 6: Right Rear Tractor Wheels Area
- *Dual wheels*
  - Condition of wheels and rims
  - Condition of tires
  - Tires same type, e.g. not mixed radial and bias types
- *Tandem axles*
- *Suspension*
- *Brakes*

STEP 7: Rear of Tractor Area
- *Frame and cross members not bent, cracked or otherwise damaged or missing lights and reflectors*



- *Air and electrical lines properly secured to frame, not damaged or chafing*

STEP 8: Coupling System Area
- *Fifth wheel* (lower)
  - No visible space between upper and lower fifth wheel
  - Locking jaws around the shank and not the head of kingpin
  - Release lever properly seated and safety latch/lock engaged
- *Fifth wheel* (upper)

STEP 9: Right Side of Trailer Area
- *Front trailer support (landing gear or dollies)*
  - Fully raised, not missing parts, not bent or otherwise damaged
  - Crank handle present and secured
- *Lights and reflectors*
- *Frame and body*
- *Proper placarding*

STEP 10: Right Rear Trailer Wheels Area
- *(Check items same as Step 6)*

STEP 11: Rear of Trailer Area
- *Lights and reflectors*
- *Cargo securement*
  - Cargo properly blocked, braced, tied, chained, etc.

STEP 12: Left Rear Trailer Wheels Area
- *Check all items as done on right side except for air tank draining*

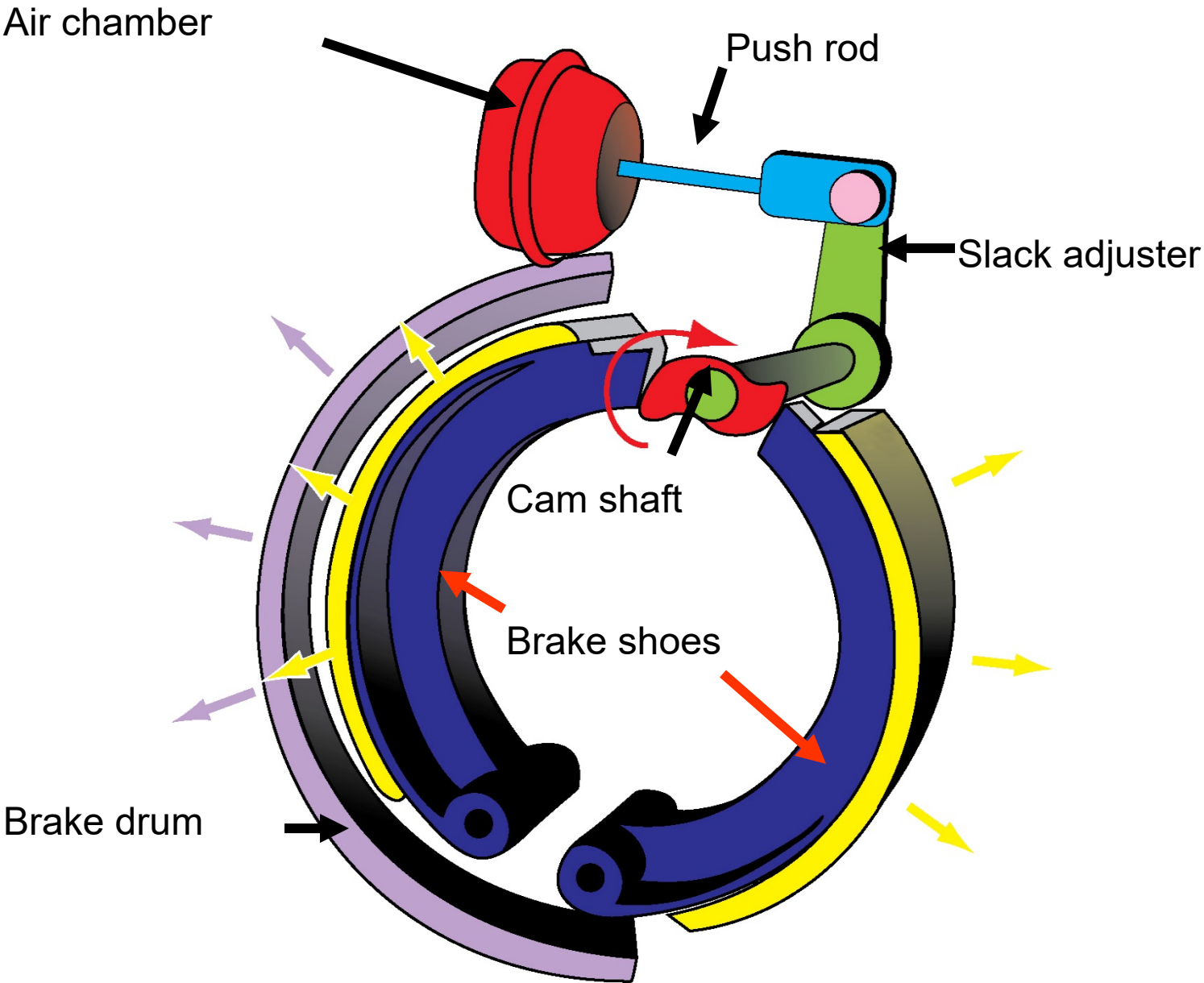
STEP 13: Left Side of Trailer Area
- *Check all items as done on right side and check my traffic side doors*

STEP 14: Left Saddle Tank Area
- *Check all items as done on right saddle tank area*

Truck Brakes

Air Brakes

Air Brakes


Air chamber
Push rod
Slack adjuster
Cam shaft
Brake shoes
Brake drum

Truck Brake Failure

Document Collection

PAPER EVERYWHERE

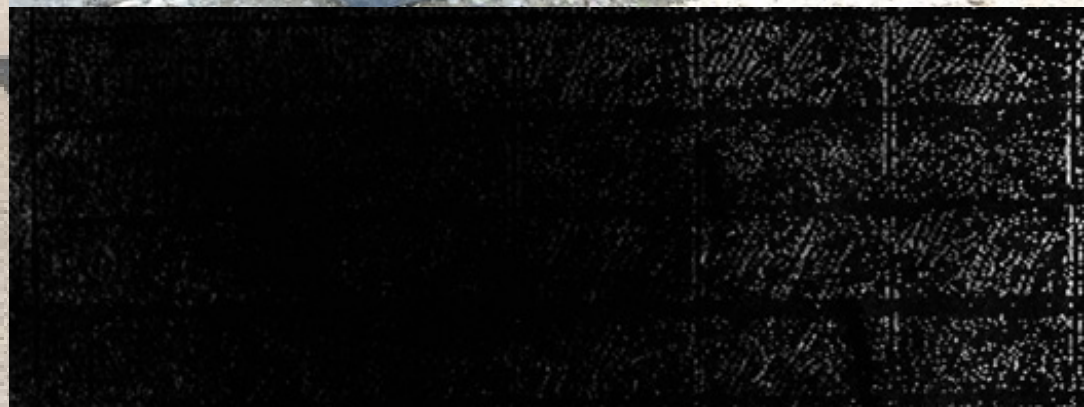
1. DQ file, personnel, medical and payroll files
2. Post-accident drug/alcohol testing documents
3. Driver logs for at least the 10 days prior to accident
4. Trip envelope
5. Routing documentation
6. Maintenance records
7. Inspection records
8. Call-in accident report to dispatch or safety from the driver
9. Safety or other training materials provided to the driver
10. Company driver/employee manuals provided to driver
11. Insurance policy declarations
12. Safety/Orientation training materials

ELECTRONIC EVIDENCE

- Electronically-stored information has become one of the biggest source of litigation today.
- On board any tractor may be:

1. Trip Recorders
2. Log Scanners
3. Paperless Log Systems
4. Electronic Logbooks
5. Weight-in-Motion Systems
6. Qualcomm (or other satellite-based systems)
7. ECM Data
8. Cellular Communication Systems
9. VORAD or similar collision warning systems data
10. Personal GPS
11. Dash Cameras – Personal and Company-owned
12. Trailer GPS

Comment:
Driver Photos & Video



Heavy Truck EDR

What is a “black box”?

- EDR- Event Data Recorder
- An EDR is an electronic system that captures and records electronic information related to an event during vehicle operation
- An EVENT is a point in time in which one or more threshold criteria are met causing the EDR to log data

EDR's for Heavy Trucks

- It is specific to the engine, not the truck
- The option must be turned on
- Hard stop threshold must be exceeded

Supported

- Configuration Data
  - Caterpillar 1995-
  - Cummins 1994-
  - Detroit Diesel 1993-
  - Mack 1998-
  - Mercedes Benz 2000-
  - Volvo 2002-
- Incident Data
  - Caterpillar 1995-
  - Cummins 2002-
  - Detroit Diesel 1998-
  - Mack 1998-
  - Mercedes Benz 2000-
  - Volvo ?-
- Snapshot
  - International
  - Paccar

EDR Data Collection

EDR Data Loss Concerns

Trip Distance	48080.9 mi	Trip Time	2486:26:55
Trip Fuel	7806.13 gal	Fuel Consumption	3.14 gal/h
Fuel Economy	6.16 mpg	Idle Time	1291:28:11
Avg Drive Load	56 %	Idle Percent	51.94 %
Avg Vehicle Speed	40.2 mph	Idle Fuel	781.75 gal

Hard Brake Limit	7.0 mph/s	
Stop Idle Limit	5 min	
Top Gear Limit	0 rpm/mph	
Top Gear-1 Limit	255 rpm/mph	Learned On: 12/14/2012 (EST)

ECM S/W	14.190
ECM Type	VCU/PLD
Config. Change	12/14/2012 (EST)

Idle Method	VSS
Idle-Load Limit	- %
Idle-RPM Limit	- rpm

Reset Lockout	No
Fleet Time Zone	-5.0 h (EST)

Maintenance Visual Reminder:

Enabled	No
Percentage	- %

Vehicle Speed Bands (mph)	10	20	30	40	50	55	60	66	71
Engine Speed Bands (rpm)	700	1000	1200	1300	1400	1500	1600	1700	1800
Percent Load Bands (%)	10	20	30	40	50	60	70	80	90

Trip Reset Status: 4 Extracted but did not reset!

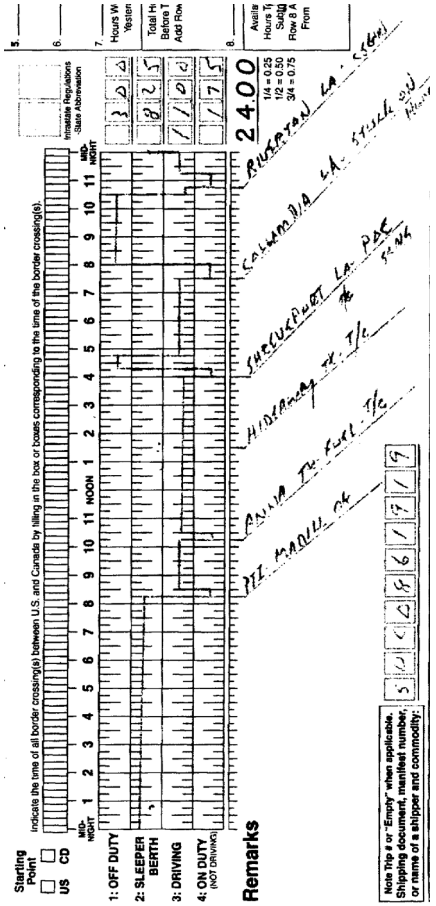
DETROIT DIESEL

Useful Data

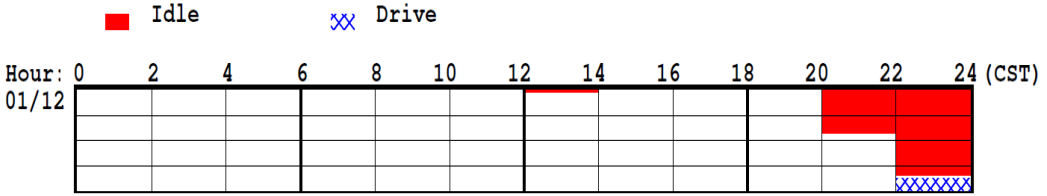
Max espd, gear ratio for limited max espd	140	%
Max engine speed at speed error	1600	r/min
Cust data, Fleet ID		
Customer Road Speed Limit	68.0	mph
Diff RSL, max vspd next highest gear	21.7	mph
Cust data, engine ECU password		

Vehicle Speed Cal (J1939-Trans)	Unavailable	R/Mile
Vehicle Speed Cal (J1939-ABS)	Unavailable	Ratio
Vehicle Speed Limit	127	MPH

Useful Data

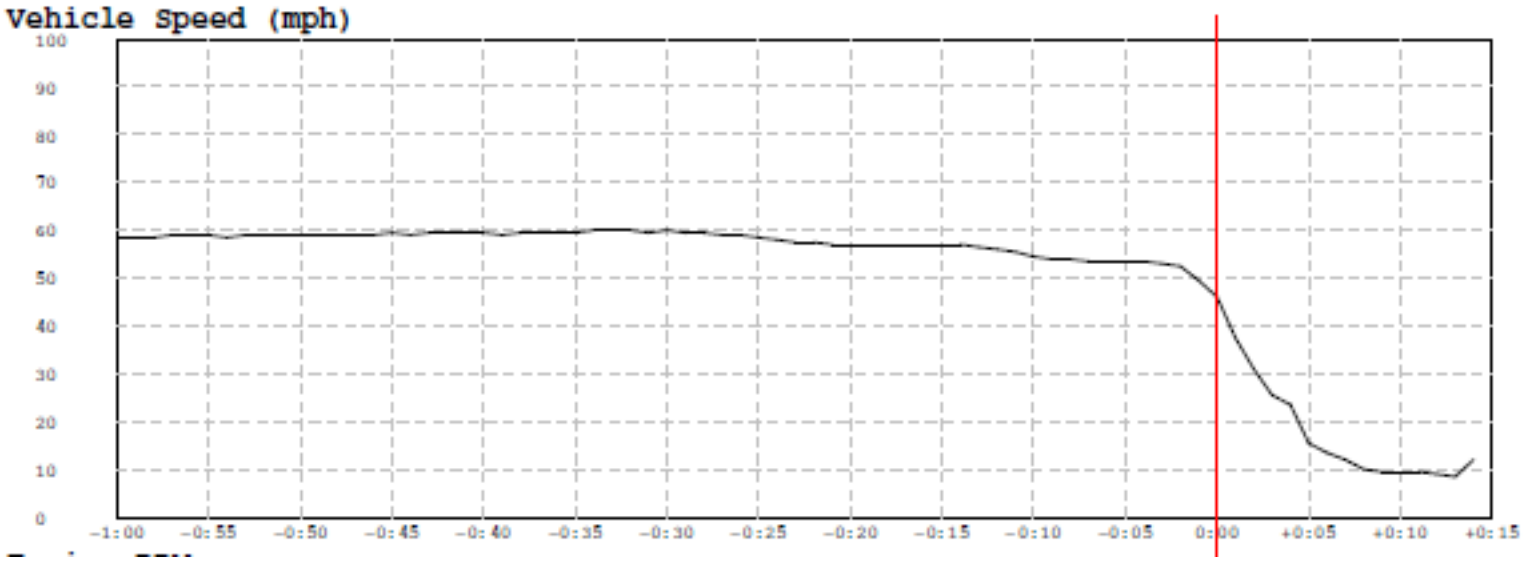


Hour (CST)	Drive(min)	Idle(min)	Off(min)
00:00-02:00	0	0	120
02:00-04:00	0	0	120
04:00-06:00	0	0	120
06:00-08:00	0	0	120
08:00-10:00	0	0	120
10:00-12:00	0	0	120
12:00-14:00	0	3	117
14:00-16:00	0	0	120
16:00-18:00	0	0	120
18:00-20:00	0	0	120
20:00-22:00	0	52	68
22:00-24:00	15	101	4

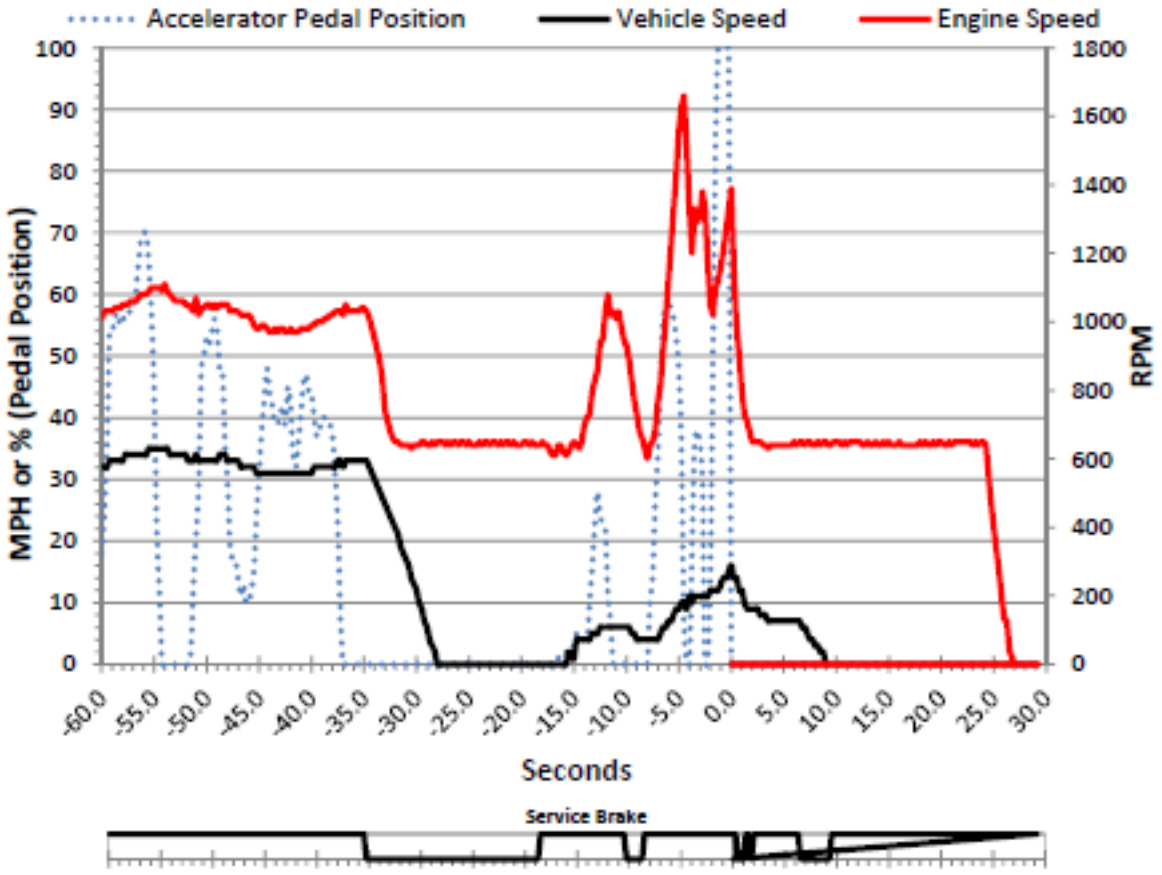


Useful Data

Time	Vehicle Speed (mph)	Engine Speed (rpm)	Brake	Clutch	Engine Load (%)	Throttle (%)	Cruise	Diagnostic Code
-0:20	57.0	1284	No	No	68.00	46.00	No	No
-0:19	57.0	1284	No	No	73.50	48.80	No	No
-0:18	57.0	1279	No	No	76.50	51.60	No	No
-0:17	57.0	1285	No	No	78.50	55.20	No	No
-0:16	57.0	1290	No	No	91.00	64.00	No	No
-0:15	57.0	1280	No	No	79.00	59.60	No	No



Useful Data


Accelerator Pedal Position
Vehicle Speed
Engine Speed
MPH or % (Pedal Position)
RPM
Seconds
Service Brake

Passenger Vehicles: <u>Legal</u>

Trends & Concerns

- More sophisticated computers onboard
- Personal GPS and video
- Cell Phones
- Required Permission to Download

- **Reminder**: Preservation Letters
- **Reminder**: Relationships Matter

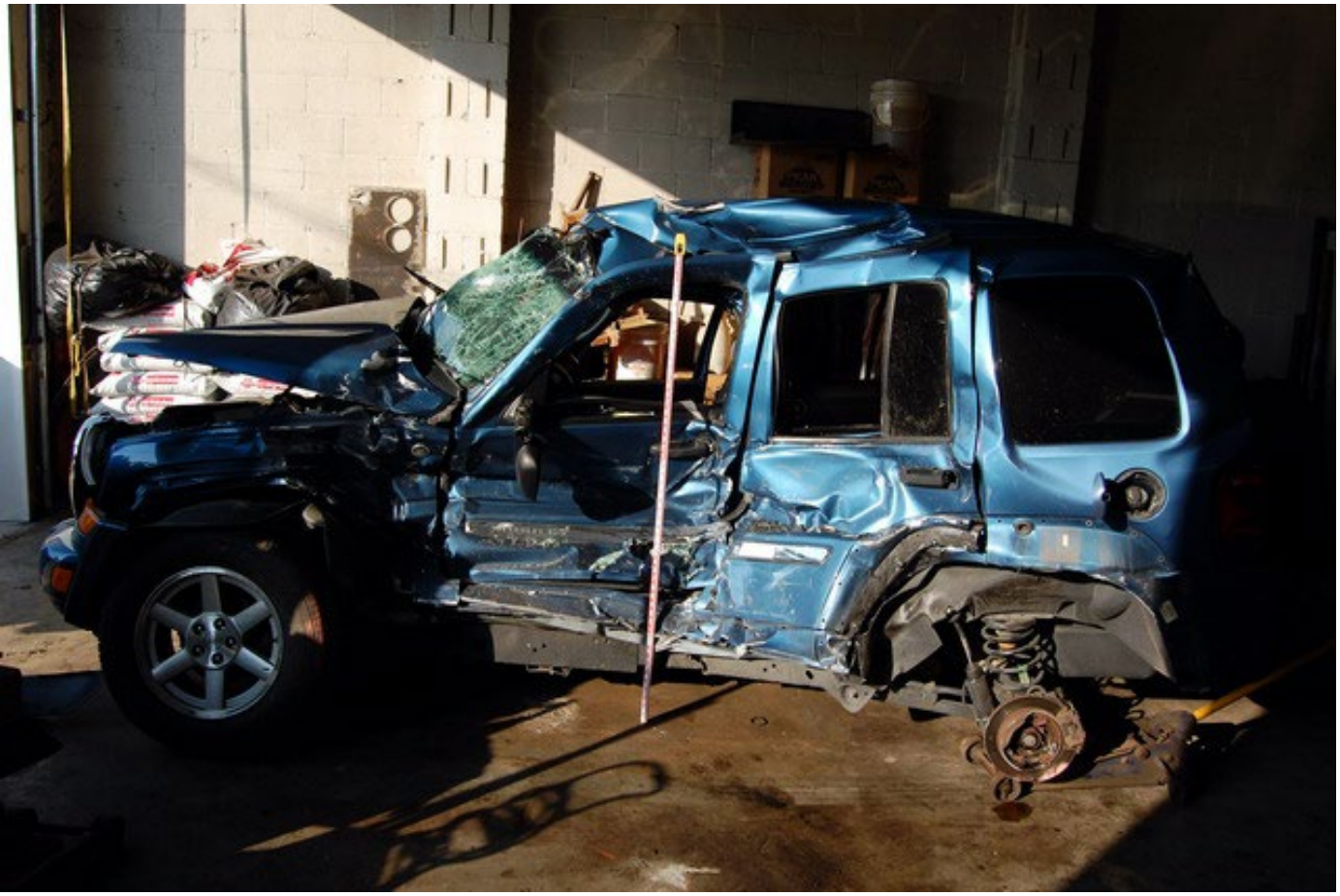
Passenger Vehicles: **Engineering**

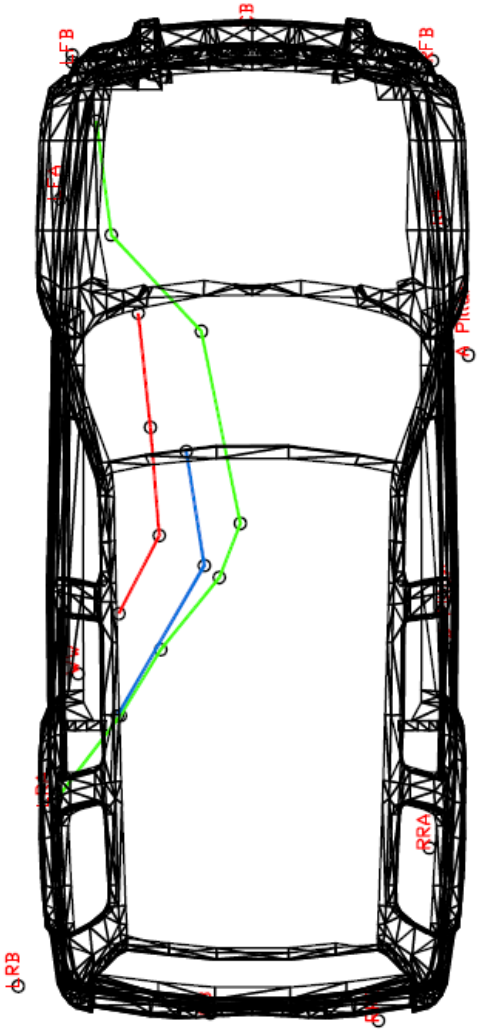
Photographs

Lights

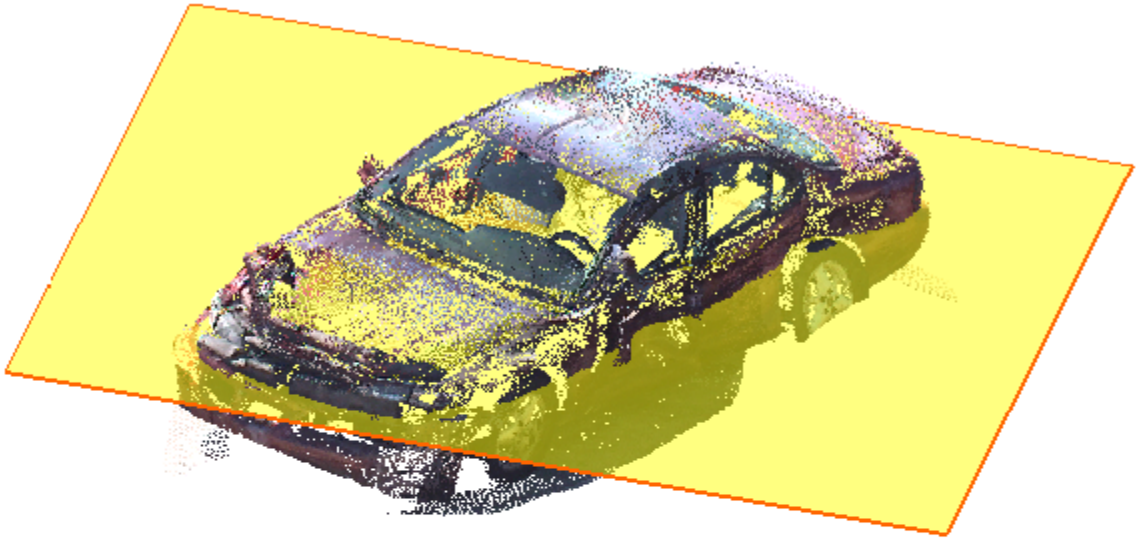
Seatbelts

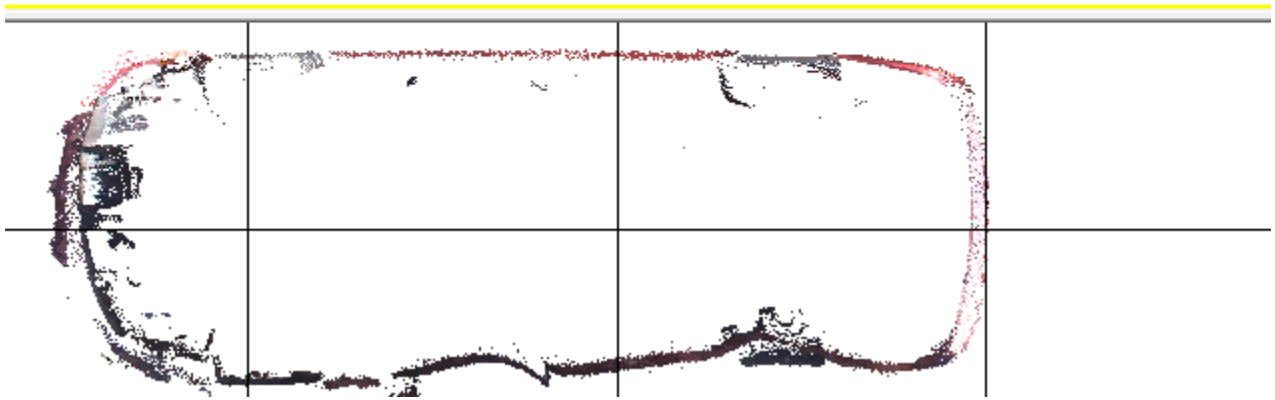
Hand Measurements



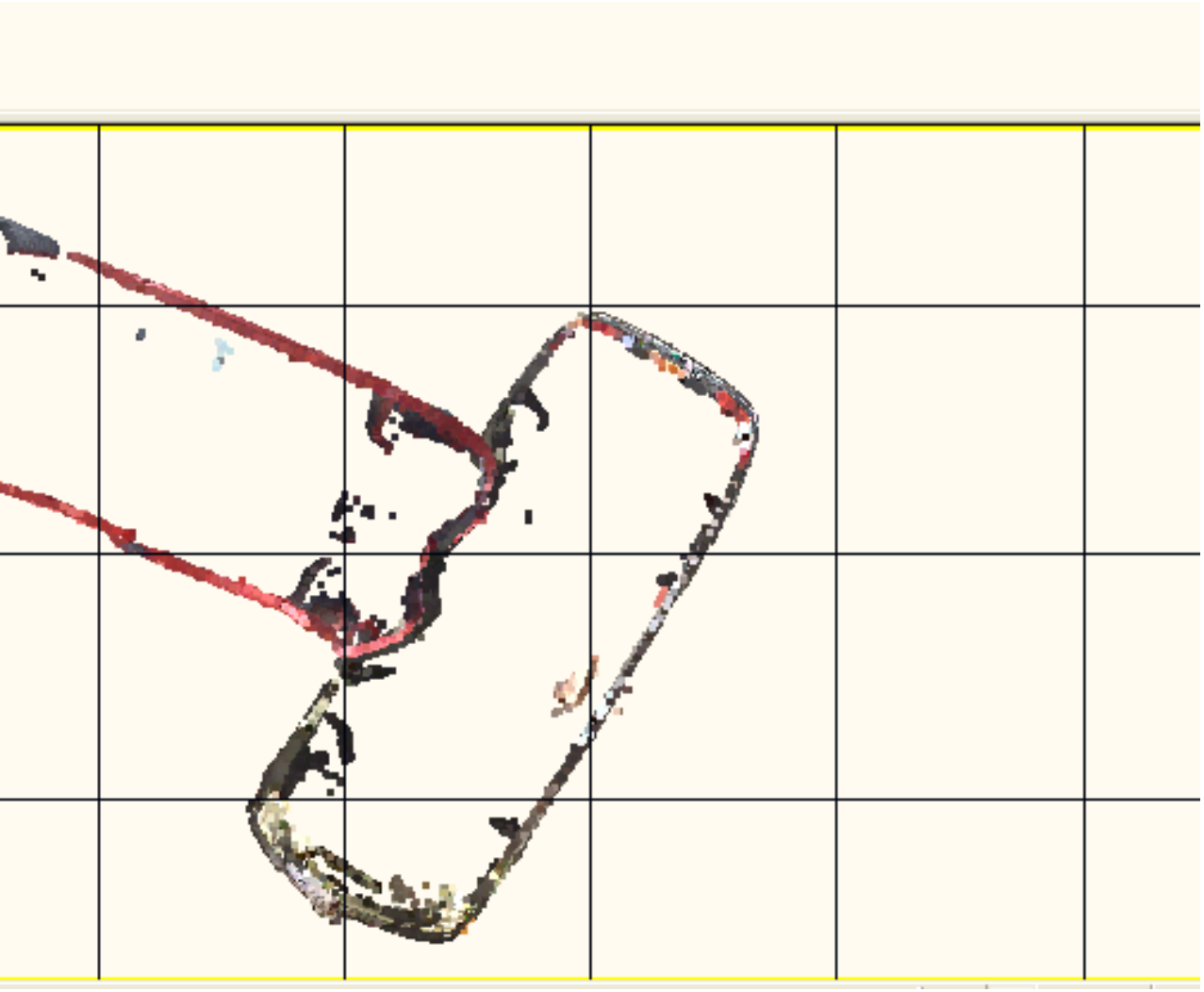


3D Scan Survey





Crash Alignment



Crush Energy

$a_2 := 314.2 \frac{lbf}{in}$

$b_2 := 77.5 \frac{lbf}{in^2}$

$A_2 := 1196.32 in^2$

$w_2 := 69 in$

$c_2 := \frac{A_2}{w_2}$ $c_2 = 17.338\,in$

$c_{2bar} := c_2$ $c_{1bar} = 6.689\,in$

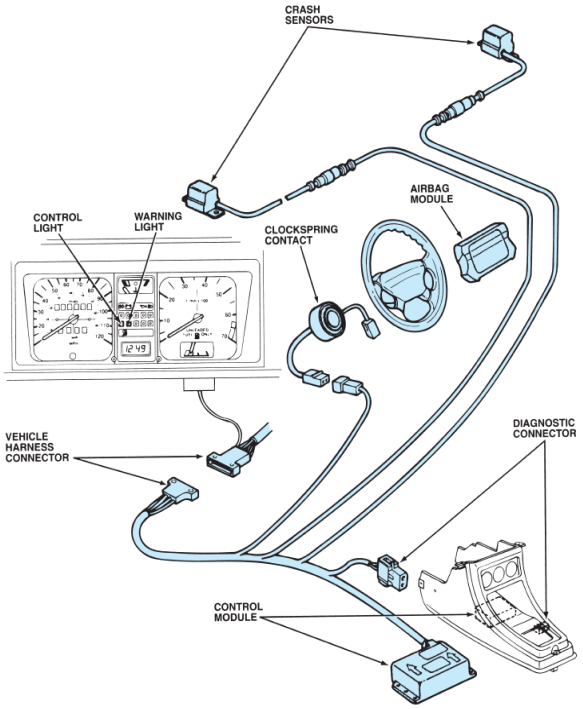
$w_{2bar} := w_2$ $w_{1bar} = 87.755\,in$

$$E_2 := w_{2bar} \cdot \left[(a_2 \cdot c_{2bar}) + \left(\frac{b_2 \cdot c_{2bar}^2}{2} \right) + \left(\frac{a_2^2}{2 \cdot b_2} \right) \right]$$

Passenger Vehicle EDR

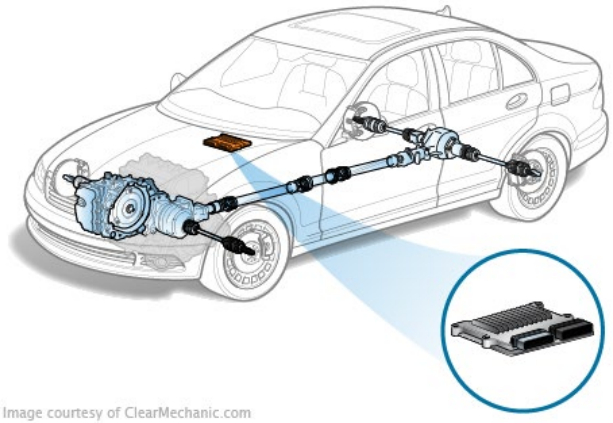
EDR's for Passenger Vehicles

- It is specific to the vehicle
- It cannot be turned off
- The acceleration criteria must be met



What is an EDR?

- Airbag Control Module (ACM)
  - Occupant Restraints Controller (ORC)
  - Restraint Control Module (RCM)
  - Airbag Sensor & Diagnostic Module (SDM)
- Powertrain Control Module (PCM)
- Rollover Sensor (ROS)



EDR Facts

- GM (Cadillac, Chevrolet, GMC, Buick) 1994-
- Ford (Lincoln) 2001-
- Toyota (Lexus, Scion) 2001-
- Chrysler (Dodge, Jeep, Fiat) 2005-
- Honda (Acura) 2011-
- Hyundai / Kia 2010-
- Others (BMW, Mitsubishis, Subaru…)

Crash Data Retrieval Methods

- Through the vehicle's OBD port
- Direct to the EDR

Types of events

- Non-Deployment
  - Acceleration observed along one of the car's axes sufficient to cause the control modules crash sensing algorithm to enable, and which is **not** sufficient to warrant a command deployment.
- Deployment
  - Acceleration observed along one of the car's axes sufficient to cause the control modules crash sensing algorithm to enable, and which is sufficient to warrant a command deployment.
  - Not dependent on actual speed change at the wheels, like heavy trucks.
  - Deployment is predictive, not reactive.

What Gets Recorded?

- Pre-crash Data
  - Vehicle speed
  - Steering wheel position
  - Percent throttle
  - Engine RPM
  - Brake switch status
  - Seat belt use
  - System parameters
- Post-crash Data
  - Impulse data

EDR Data

Pre-crash data

Parameter	-2.5 sec	-2.0 sec	-1.5 sec	-1.0 sec	-0.5 sec
Vehicle Speed (MPH)	72	71	67	60	48
Engine Speed (RPM)	4544	3520	2432	1536	1472
Percent Throttle	27	27	27	27	26
Brake Switch Circuit Status	OFF	ON	ON	ON	ON

Pre-crash data

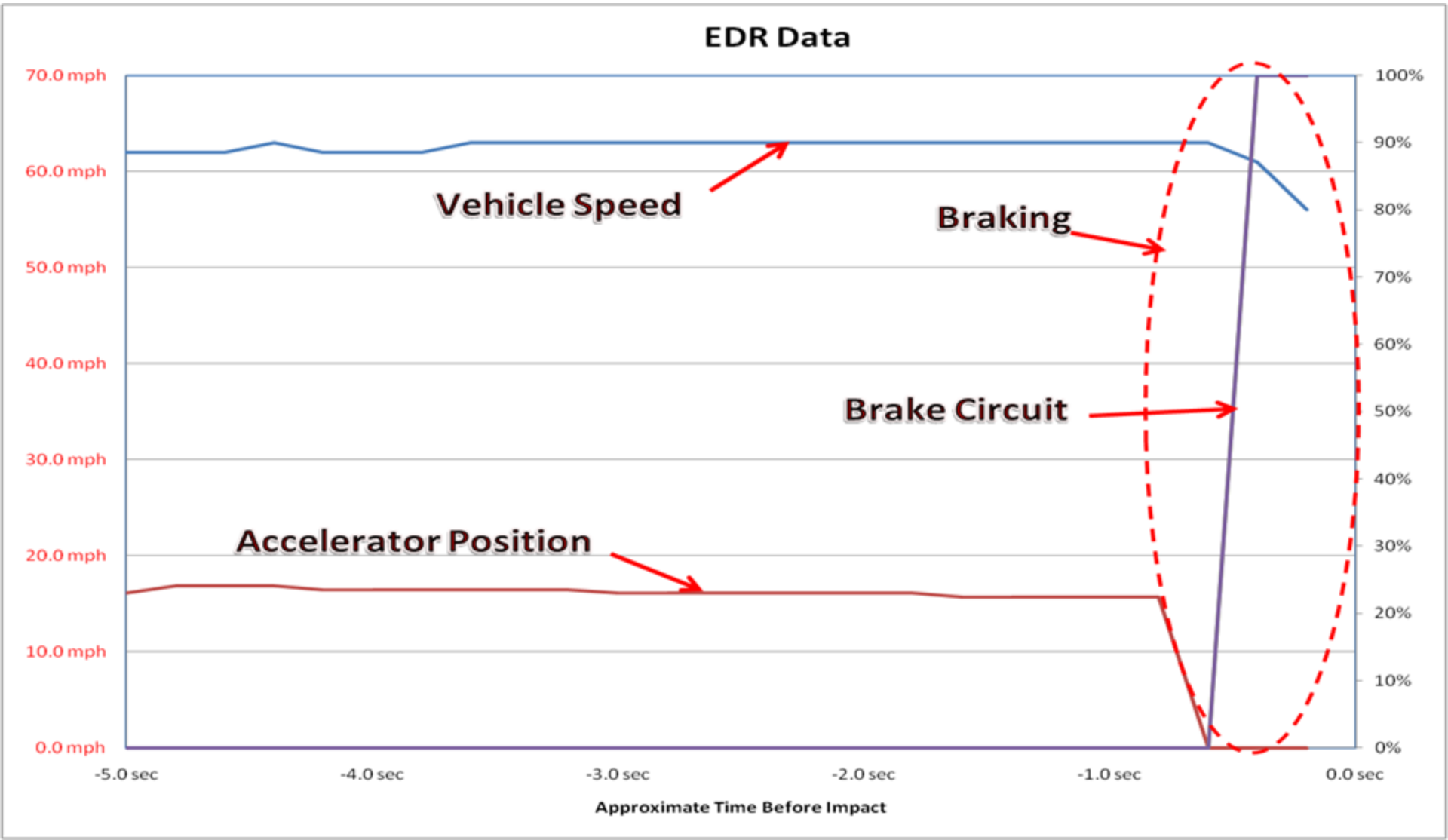
Parameter	-1.0 sec	-0.5 sec
Reduced Engine Power Mode	OFF	OFF
Cruise Control Active (If Equipped)	No	No
Cruise Control Resume Switch Active (If Equipped)	No	No
Cruise Control Set Switch Active (If Equipped)	No	No
Engine Torque (foot pounds)	5.35	16.78

EDR Data

Ignition Cycles At Investigation	10913
SIR Warning Lamp Status	OFF
Total Time SIR Warning Lamp was ON Since the Counter was Last Reset (seconds)	0
Number of Ignition Cycles SIR Warning Lamp was ON/OFF Continuously	5269
Ignition Cycles At Event	10913
Ignition Cycles Since DTCs Were Last Cleared	255
Driver's Belt Switch Circuit Status	BUCKLED
Passenger's Belt Switch Circuit Status	BUCKLED
Passenger Classification Status at Event Enable	Large Occupant Classification Type #1
Current Passenger Position Status at Event Enable	Position Not Applicable
Previous Passenger Position Status at Event Enable	Unknown

Bad Brakes?

Bad Brakes?


EDR Data
70.0 mph
60.0 mph
50.0 mph
40.0 mph
30.0 mph
20.0 mph
10.0 mph
0.0 mph
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Vehicle Speed
Braking
Brake Circuit
Accelerator Position
-5.0 sec
-4.0 sec
-3.0 sec
-2.0 sec
-1.0 sec
0.0 sec
Approximate Time Before Impact

Analysis:
This is Hard

A CATASTROPHIC LOSS WILL REVEAL **ALL DEFICIENCIES** IN YOUR OPERATIONS - **AT THE EXACT WRONG TIME**

THE ANSWER IS PREPARATION

- Teamwork starts well before any accident
  - Single individual coordinating accident response
  - Outside counsel doesn't think about company politics
- Simplify accident investigations with detailed process for
  - Driver
  - Safety Personnel
  - Preservation Team
  - Checklists and Training on the Checklist are Vital
  - Procedure must be fool proof and privileged
- Have the right people in place – Counsel, Engineers, Investigators

POLICY BECOMES CULTURE

- Any transportation company benefits from coordinated national loss investigation team.
- A company should not be figuring this out on the day of the accident.
  - This is a process that can be turned into a “policy”.
  - Your lawyers, engineers and investigators must be experienced with the trucking industry.
  - Your team should have relationships with local authorities investigating your accident.
  - An annual training program for safety, management, dispatch and drivers on the accident response protocol.

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