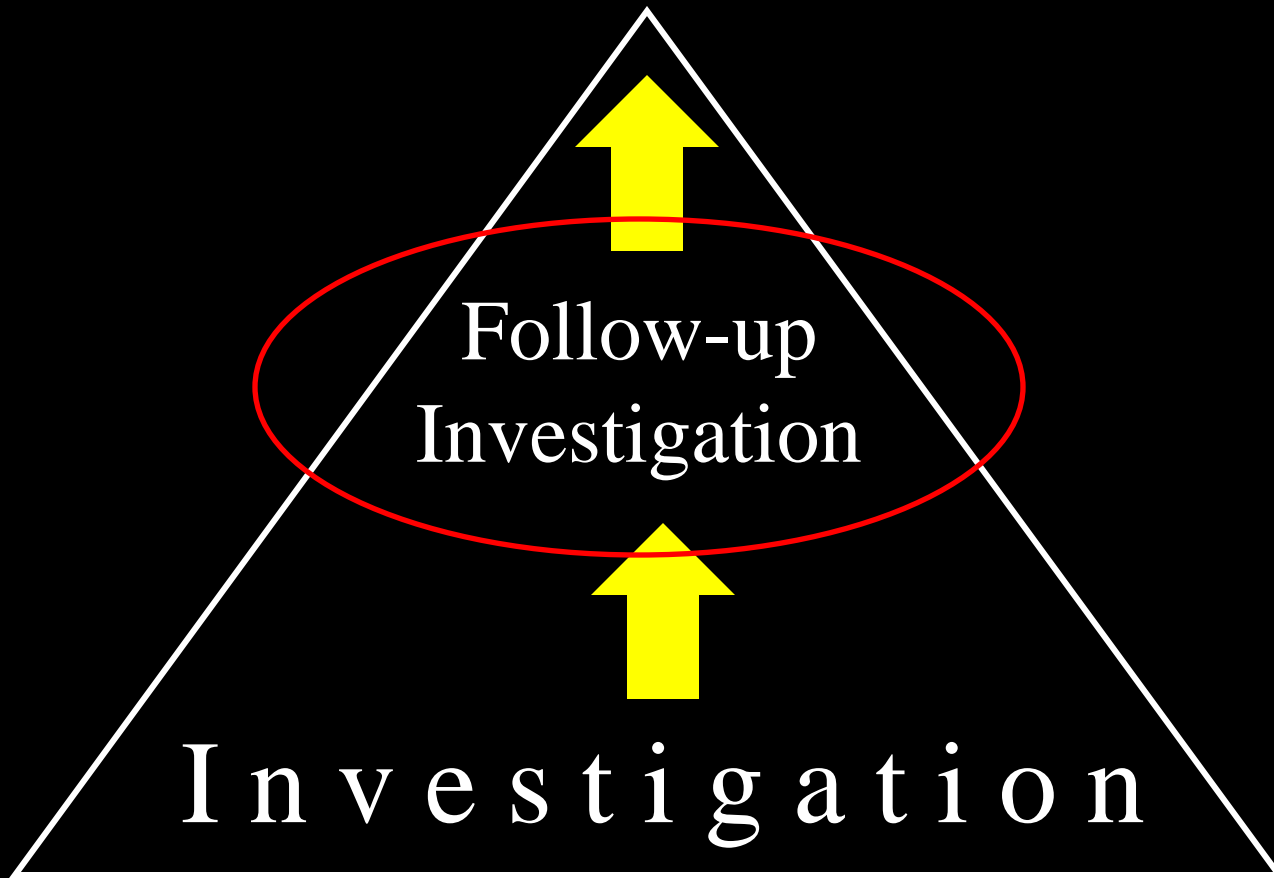


# Crash Reconstruction



Today's plan:

Familiarize you with crash  
vocabulary and crash investigation.

Today's plan:

Suggest some follow-up investigation that can strengthen a MV case.

# Today's plan:

Emphasis:

- proof of operation
- information from people
- digital evidence
- photography
- mechanical failure as causation



This Power Point will be available  
for you after today's presentation.

The handout includes a  
presentation narrative, and my  
contact information.

There will be time for questions  
at the end of the presentation.





**CRASH**

**WRECK**

**COLLISION**

Your case is only as strong as  
**your investigation.**

The defense will  
**attack the evidence,**  
not the calculations.

What makes a good  
investigation?



road defects  
mechanical or tire failure  
prior collision  
evidence of impairment  
an intervening event

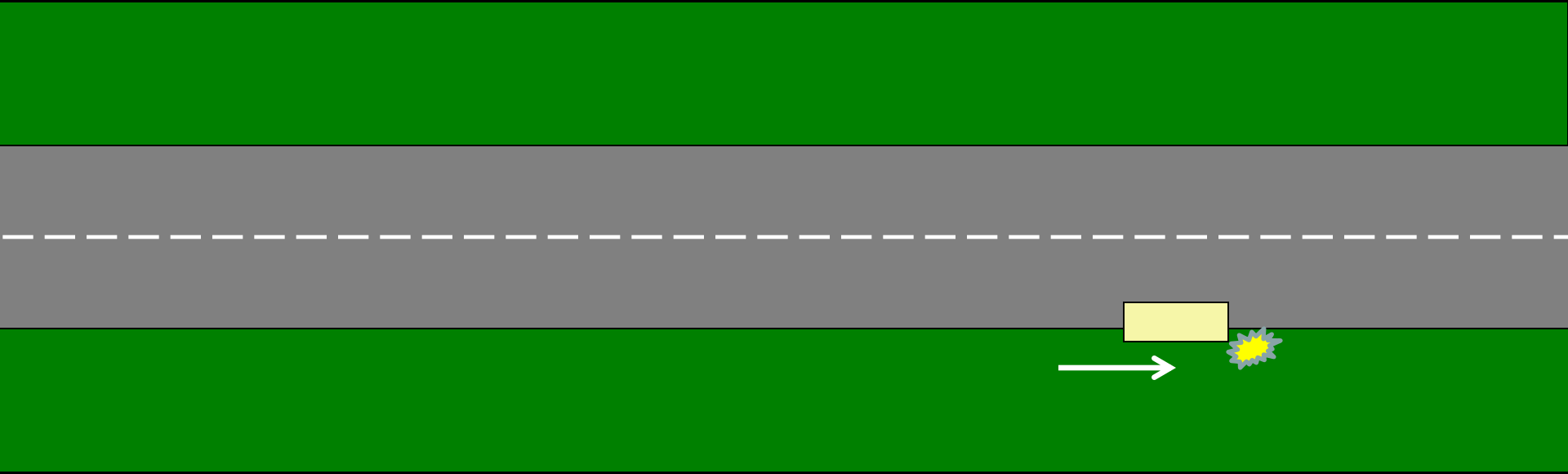


**CAUSATION**



AN ***EXTRAORDINARY***  
PIECE OF INVESTIGATION:

*pre-impact*  
*proof of impaired operation*



a 7-year old little boy is struck  
while walking on the shoulder







blue paint

900 ft prior to the POI





1000 ft prior to the POI



EXHIBIT  
26 A

one small piece of debris



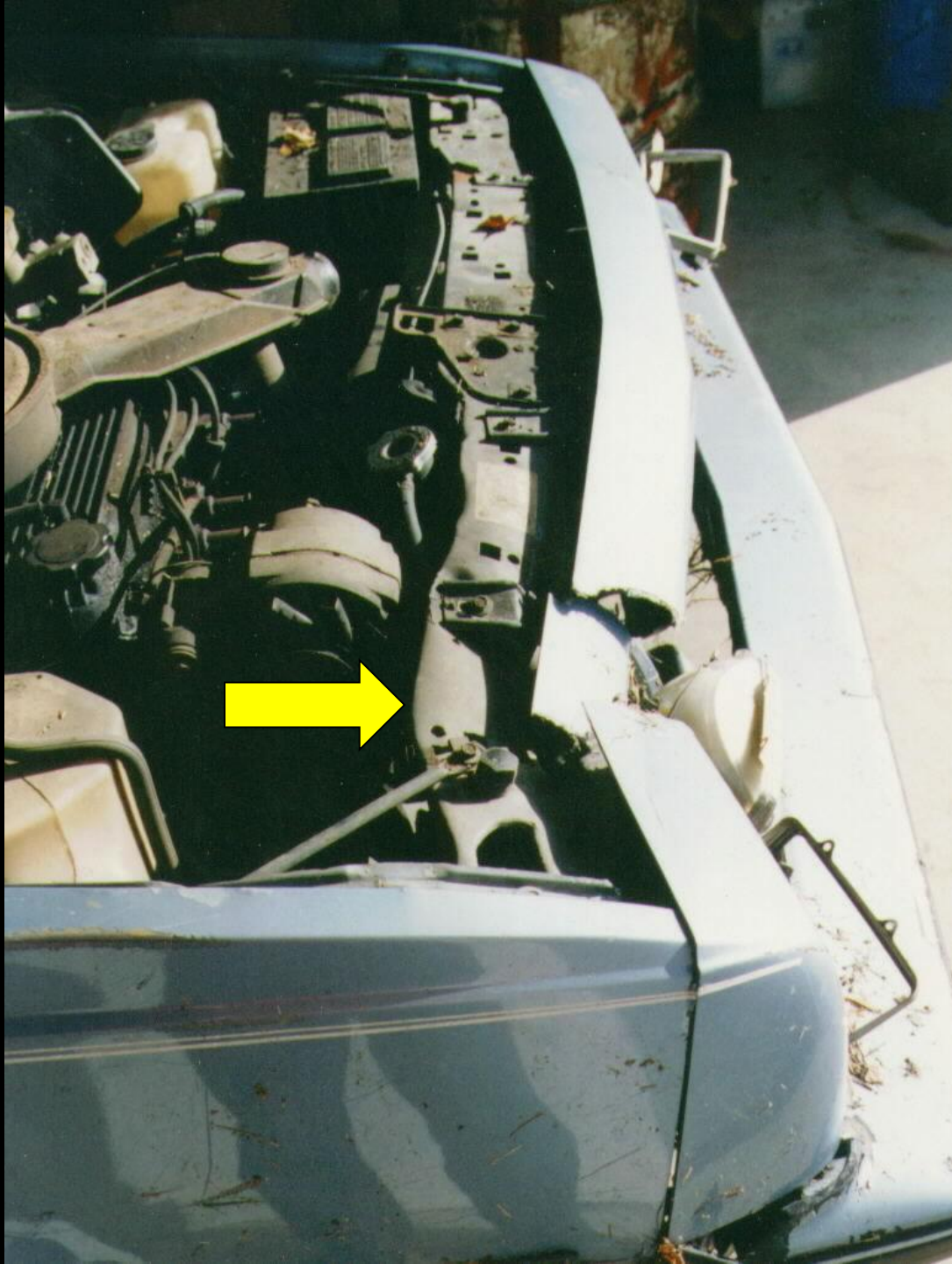


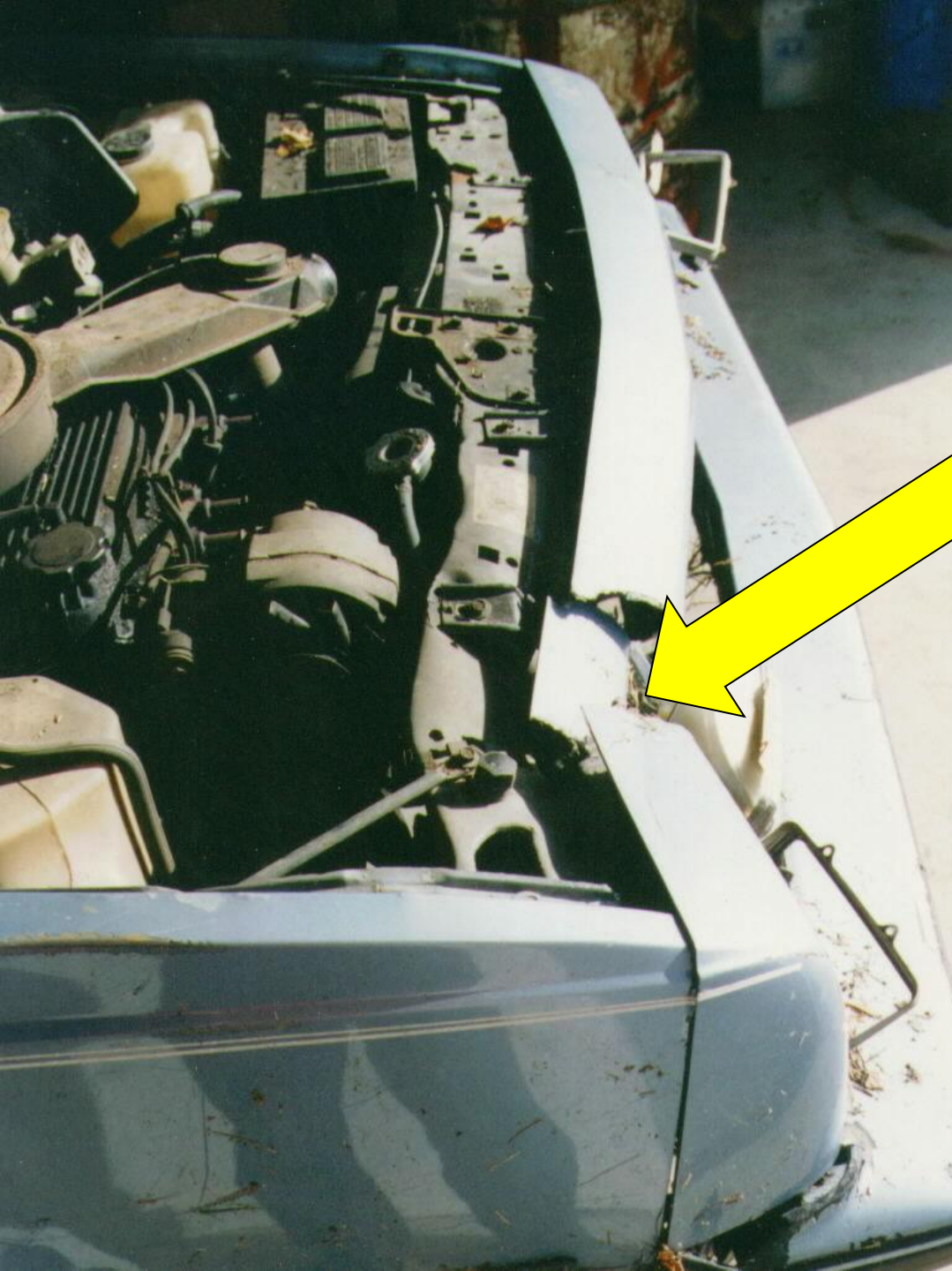
EXHIBIT  
26 B














**EVIDENCE**

CASE NO. \_\_\_\_\_ ITEM NO. \_\_\_\_\_

DATE 6/14/12 TIME 0200 AM/PM ~~X~~

PLACE \_\_\_\_\_

REMARKS FRONT GRILL

OFFICER David Law

proof of operation

WHERE WOULD YOU LOOK  
FOR FINGERPRINTS OF THE  
OPERATOR ?





print image sent  
to forensics lab

starter button



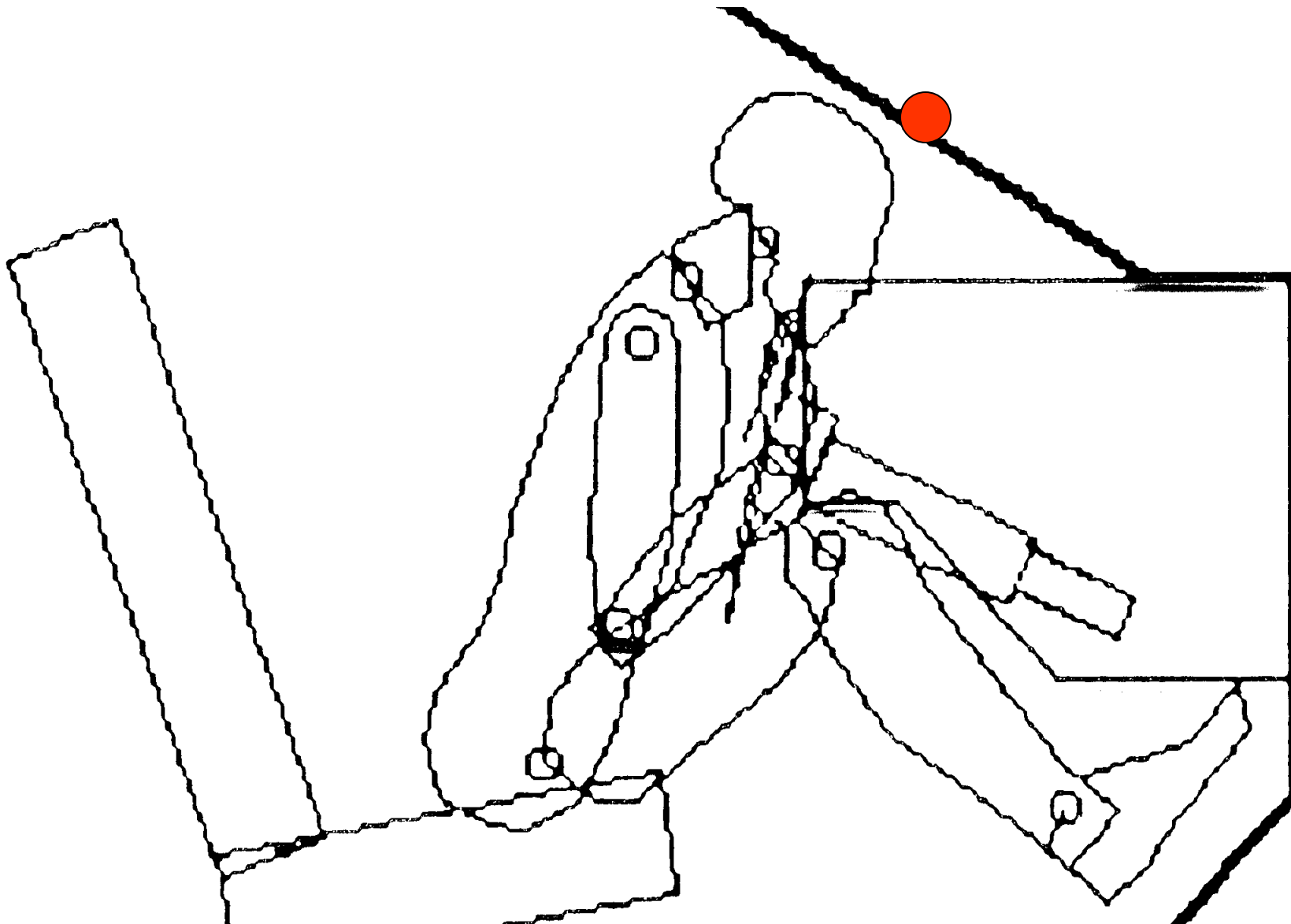
suspected operator



suspected passenger



# CONTACT POINTS INSIDE VEHICLE





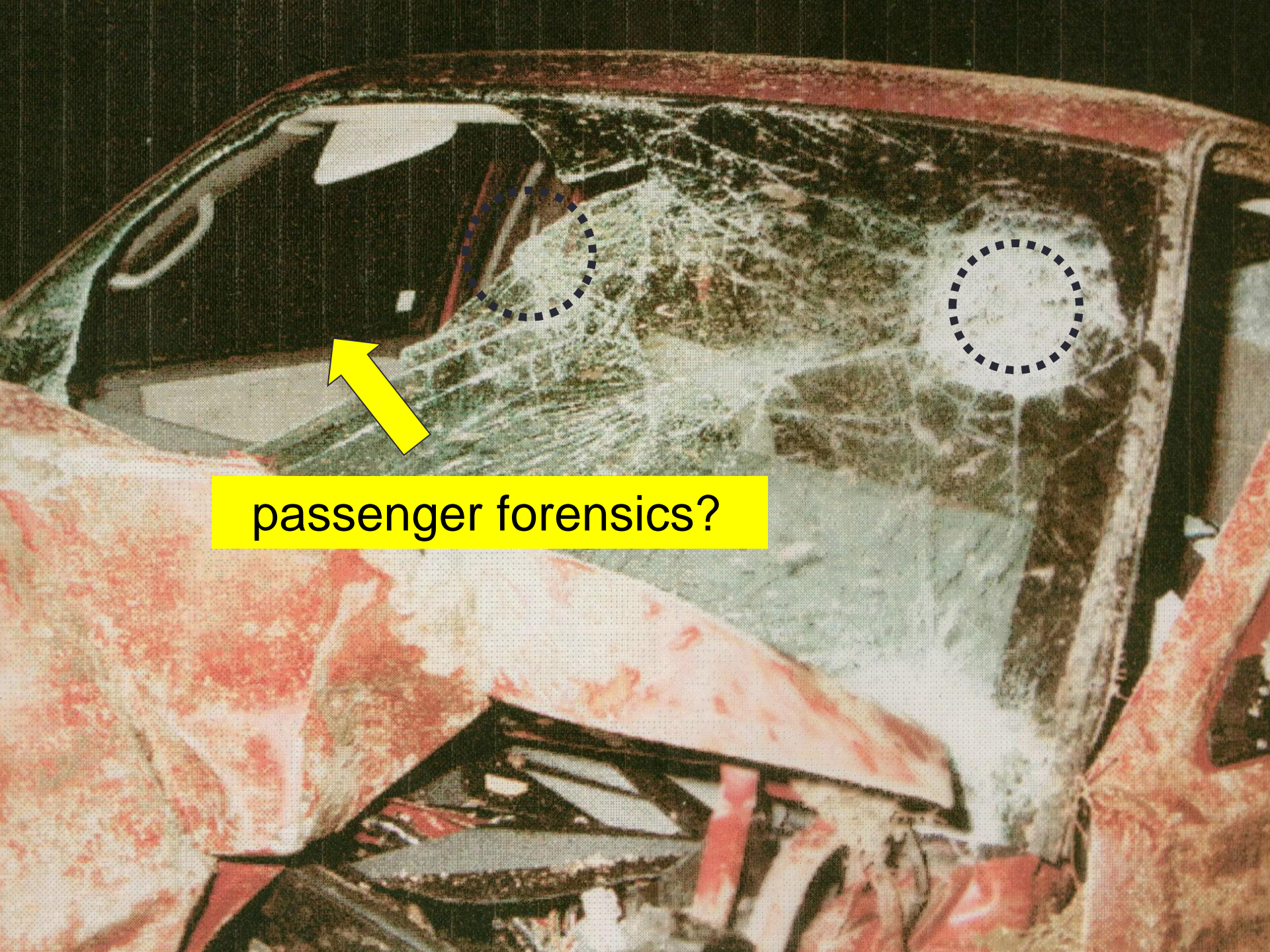


frontal collision









passenger forensics?

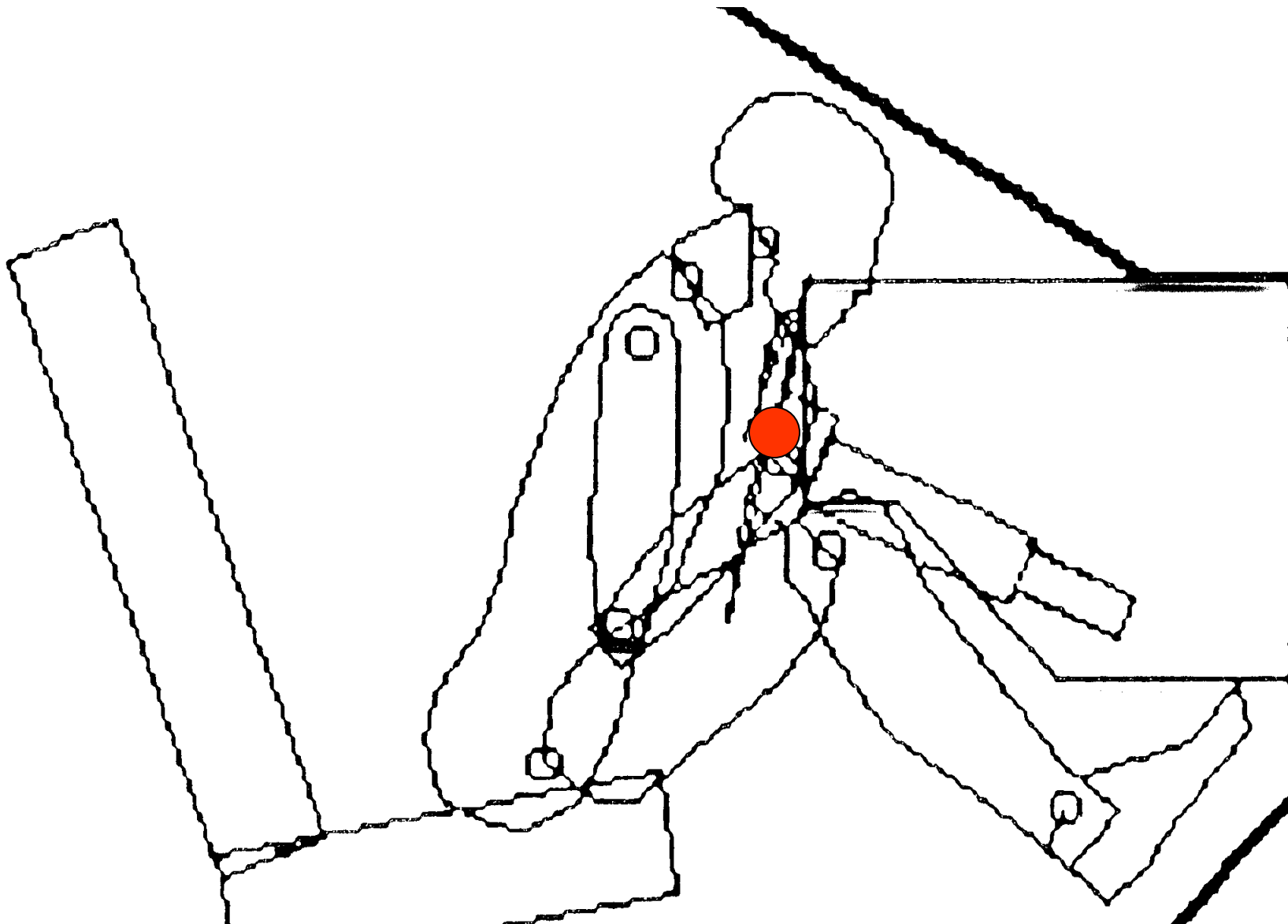




side collision



# CONTACT POINTS INSIDE VEHICLE

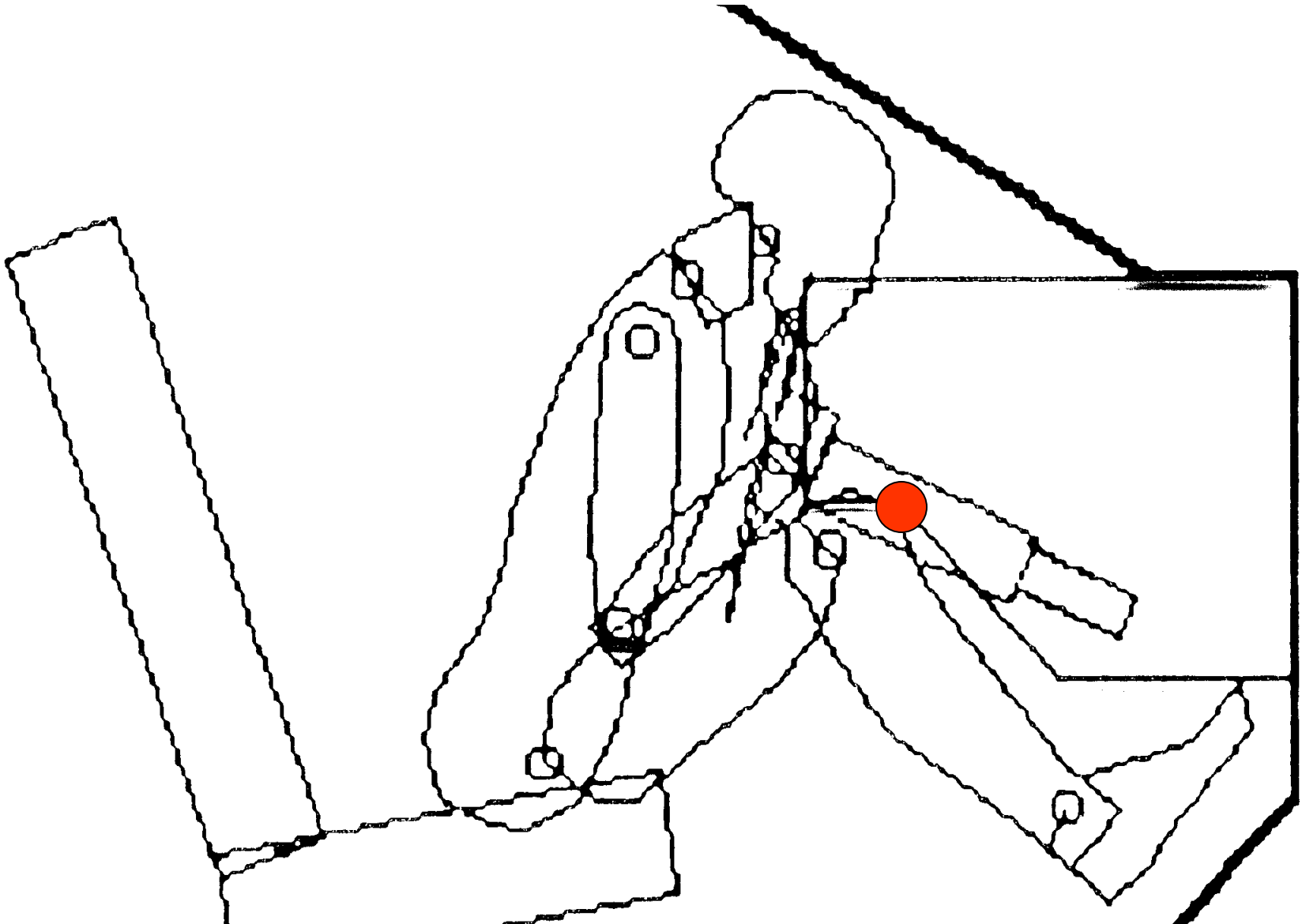




A photograph of a person lying down, possibly in a hospital bed. The person's face is partially visible, and they appear to be wearing a white garment. A medical device, possibly a heart rate monitor or similar, is attached to their chest with a black cable. The device has a circular white area with a red dot in the center. The background is dark and indistinct.

*“I think we know  
who the driver is.”*

# CONTACT POINTS INSIDE VEHICLE







# EVIDENCE

CASE NO. 970413 ITEM NO. 04

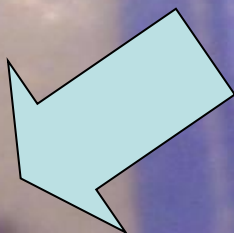
DATE 2/7/97 TIME \_\_\_\_\_ AM/PM

PLACE dash, driver's side

REMARKS break, fiber

OFFICER Sgt. Anderson





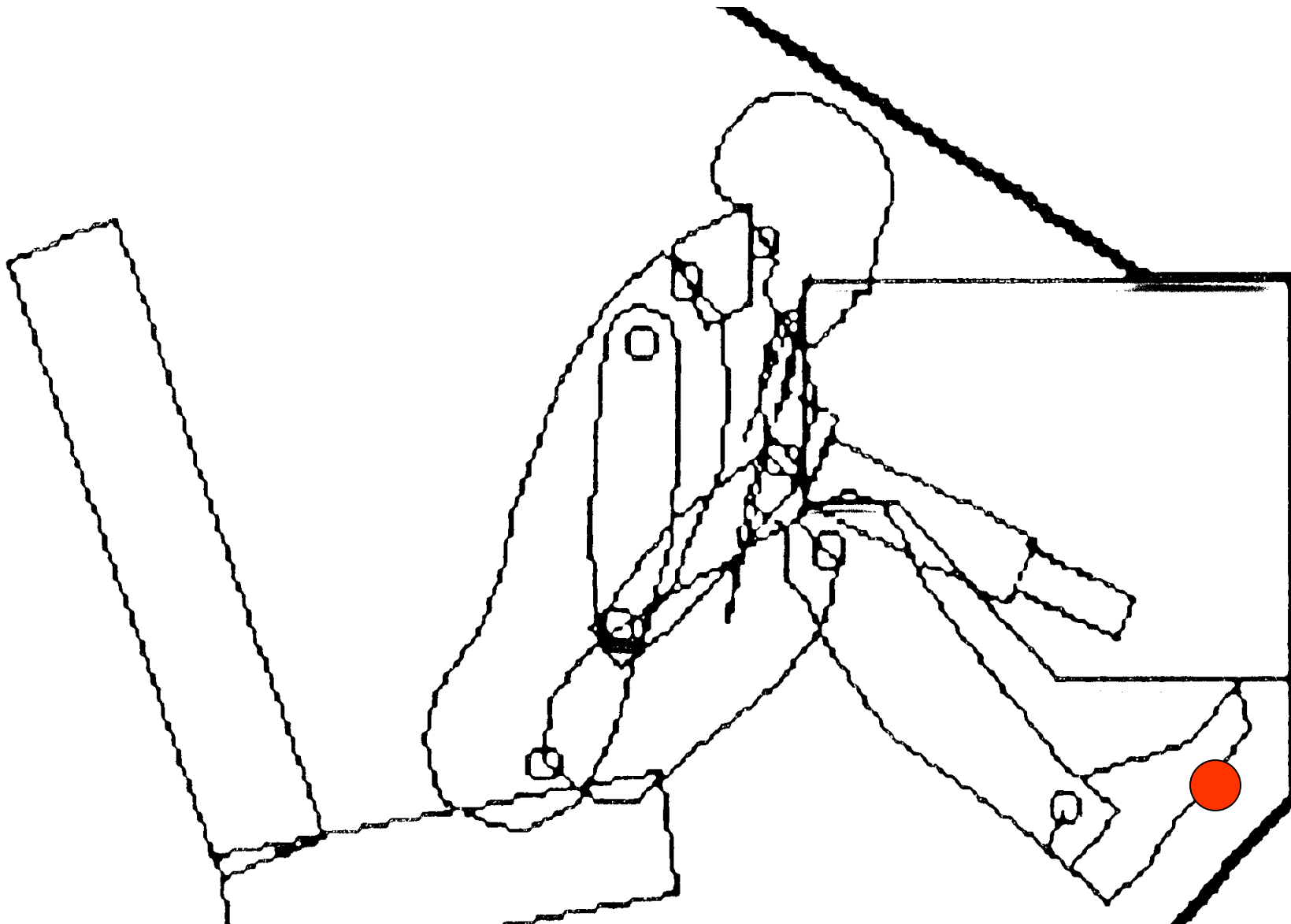
**INCHES**



vinyl fusion

transfer onto pants?

# CONTACT POINTS INSIDE VEHICLE











accelerator pedal  
mark on sole

occupant injuries

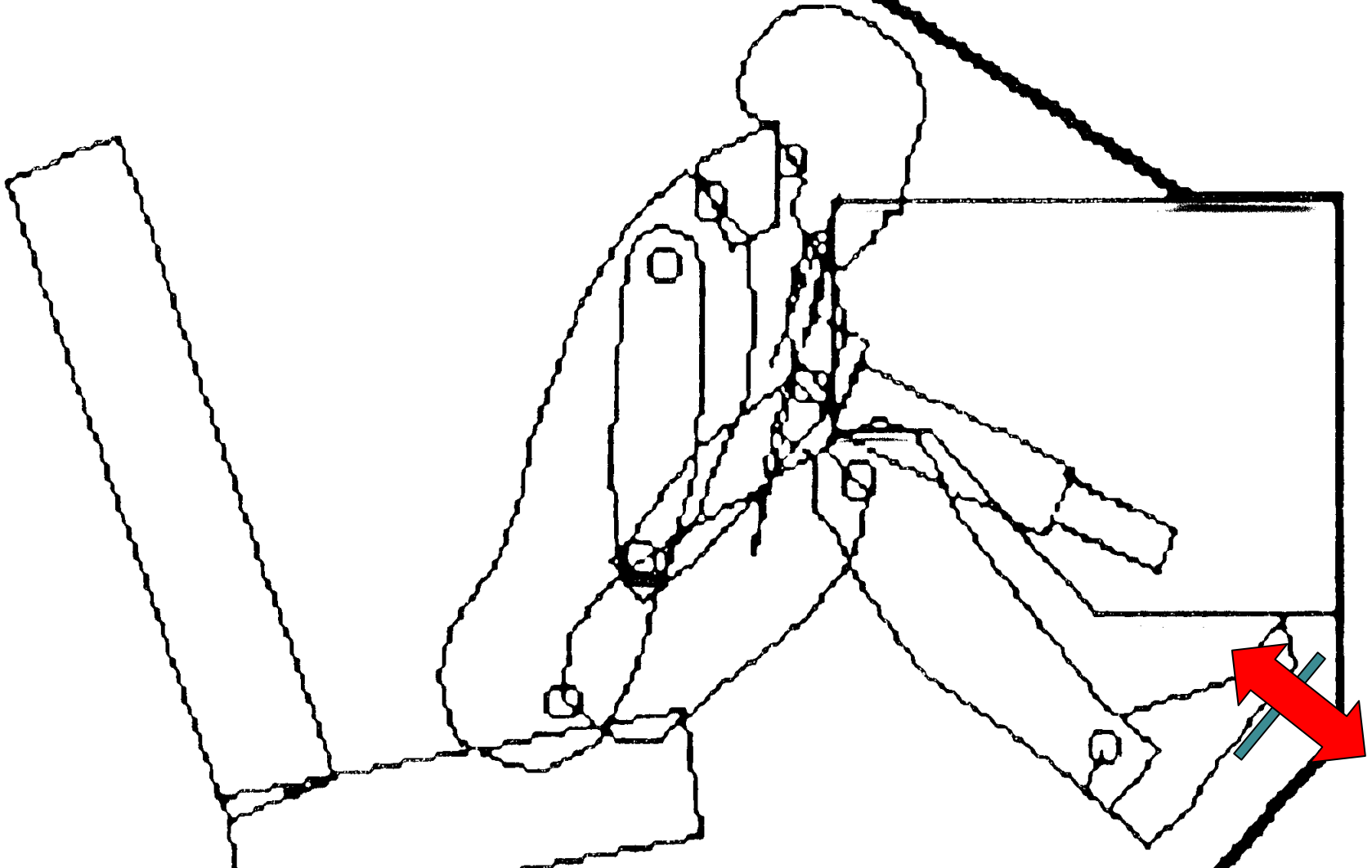


without this  
photograph?





UNRESTRAINED

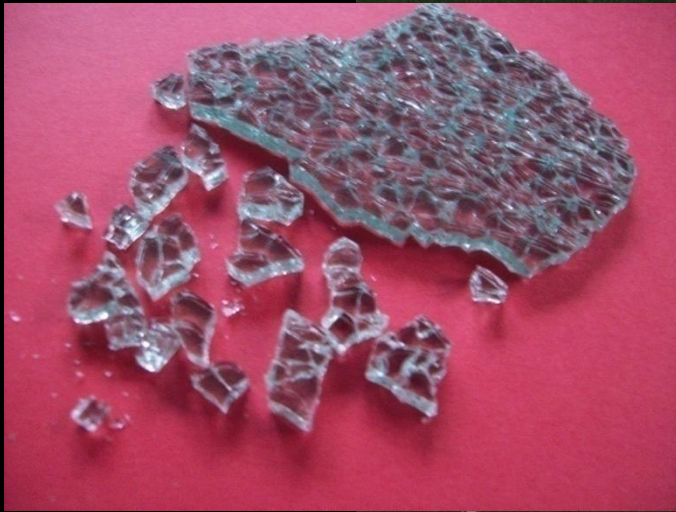












**“DICING” caused by tempered glass**

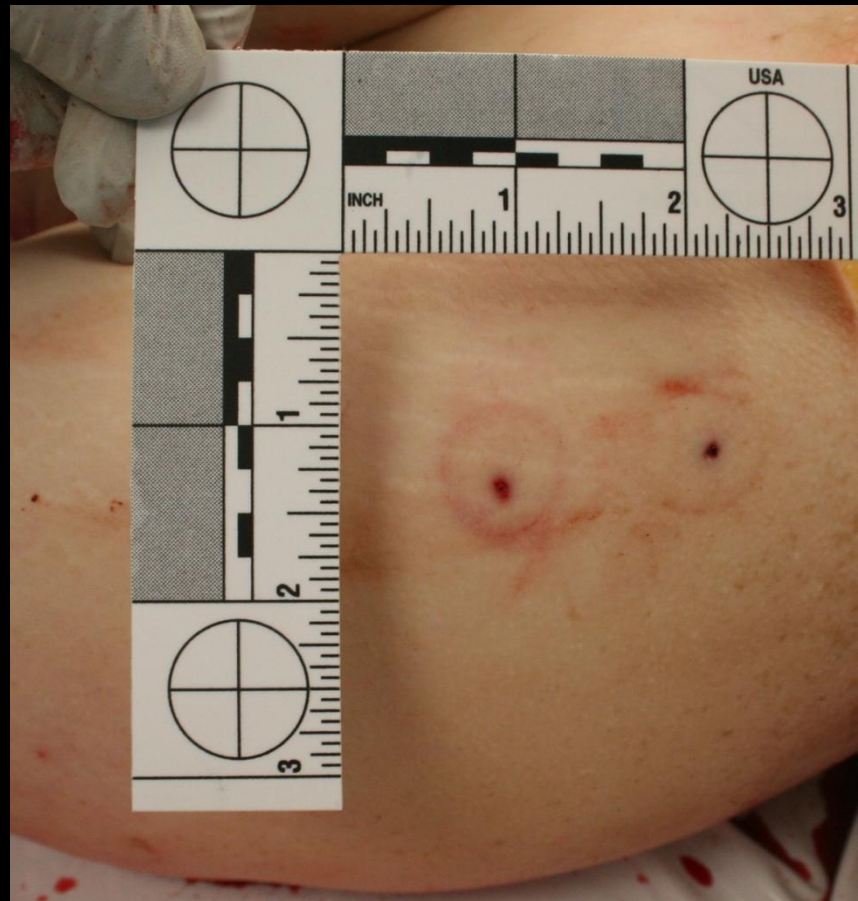
# A-pillar injury







# “pattern injuries”







side collision



operator's knee strike on gear shifter

information from  
people

How difficult is it  
to be a witness?





1. What part of the vehicle struck the utility pole?

\_\_\_\_\_ left front

\_\_\_\_\_ right front

\_\_\_\_\_ center of front

1. What part of the vehicle struck the utility pole?

  ✓   left front

       right front

       center of front



2. Which side of the vehicle came up first during the rolling motion?

\_\_\_\_\_ driver's side

\_\_\_\_\_ passenger's side

\_\_\_\_\_ don't know

2. Which side of the vehicle came up first during the rolling motion?

☒ driver's side

☐ passenger's side

☐ don't know

3. How far was it from the impact with the utility pole to the start of the rollover?

\_\_\_\_\_ ft



3. How far was it from the impact with the utility pole to the start of the rollover?

45 ft

4. Did you at any time during the collision see the driver ejected from the vehicle?

\_\_\_\_\_ YES

\_\_\_\_\_ NO

4. Did you at any time during the collision see the driver ejected from the vehicle?

\_\_\_\_\_ YES

\_\_\_  \_\_\_ NO



5. In what position was the vehicle when it came to its final rest?

\_\_\_\_\_ on its wheels

\_\_\_\_\_ on its roof

\_\_\_\_\_ on the driver's side

\_\_\_\_\_ on the passenger's side

5. In what position was the vehicle when it came to its final rest?

\_\_\_\_\_ on its wheels

☒ **on its roof**

\_\_\_\_\_ on the driver's side

\_\_\_\_\_ on the passenger's side

6. What part of the vehicle was facing you when it came to rest?

\_\_\_\_\_ front

\_\_\_\_\_ rear

\_\_\_\_\_ driver's side

\_\_\_\_\_ passenger's side



6. What part of the vehicle was facing you when it came to rest?

☐ front

☐ rear

☐ driver's side

☒ passenger's side

7. What was the distance  
from the utility pole to the final  
rest of the vehicle?

\_\_\_\_\_ ft

7. What was the distance from the utility pole to the final rest of the vehicle?

80 ft



8. What was the speed of the vehicle when it hit the pole?

\_\_\_\_\_ mph

8. What was the speed of the vehicle when it hit the pole?

45 mph

9. How many times did the vehicle roll over?

\_\_\_\_\_ less than one

\_\_\_\_\_ one

\_\_\_\_\_ more than one

\_\_\_\_\_ more than two

9. How many times did the vehicle roll over?

☒ less than one

☐ one

☐ more than one

☐ more than two



10. What color was the vehicle?

\_\_\_\_\_ black

\_\_\_\_\_ red

\_\_\_\_\_ blue

\_\_\_\_\_ green

\_\_\_\_\_ white

10. What color was the vehicle?

\_\_\_\_\_ black

\_\_\_\_\_ red

\_\_\_\_\_ blue

— ✓ — **green**

\_\_\_\_\_ white

IS THE LOCATION  
OF EACH WITNESS  
DOCUMENTED?

Skid marks: RF 30 ft  
LF 33 ft  
RR 31 ft  
LR 32 ft

drag factor : 0.78

P - utility pole  
T - traffic light  
S - scrape marks from body

Scale: 1 inch = 10 ft

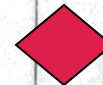


Swit St.



P

Meter St.



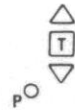


Skid marks: RF 30 ft  
LF 33 ft  
RR 31 ft  
LR 32 ft

drag factor : 0.78

P - utility pole  
T - traffic light  
S - scrape marks from body

Scale: 1 inch = 10 ft



Swit St.



P

Meter St.



Visit the scene, and see it through  
the eyes of *your witness*.



stop sign



7-yr old on bicycle  
struck by car

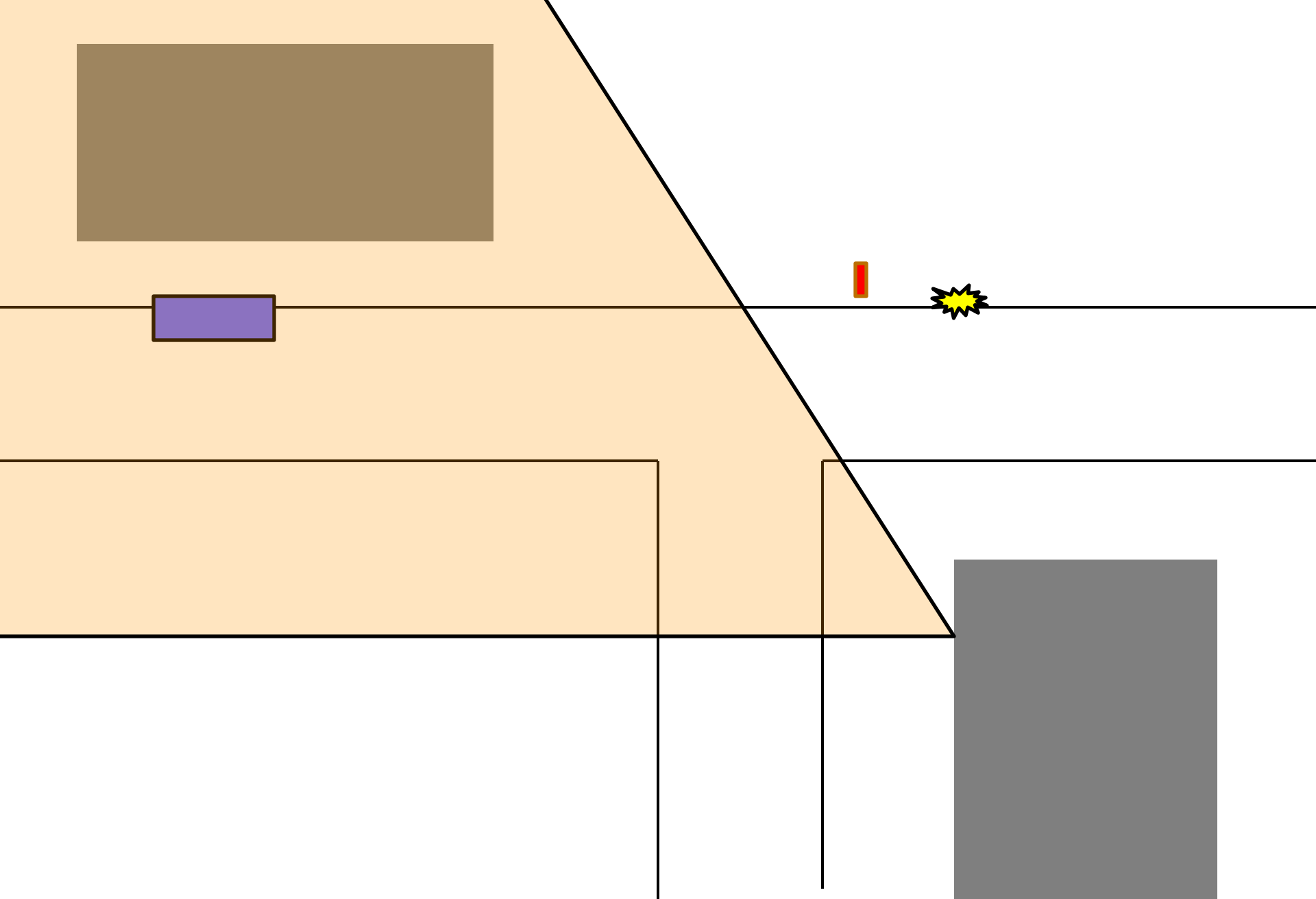






“THE GUY NEVER EVEN STOPPED FOR THE STOP SIGN.”





# *“VISUAL CUES”*

MAKE IT EASIER TO RECALL  
INFORMATION ACCURATELY.






witness view





sitting in the police cruiser





Recreate the scene  
to help the witness  
remember better!

# ASK A WITNESS:

- Where were you? (Go there to take the statement)
- What were you doing when you became aware of the crash?
- Was anything moved before we arrived?
- Do you know who was driving?
- How do you know who was driving?

A WITNESS MAY  
REACH A CONCLUSION  
AND THINK IT WAS AN  
OBSERVATION

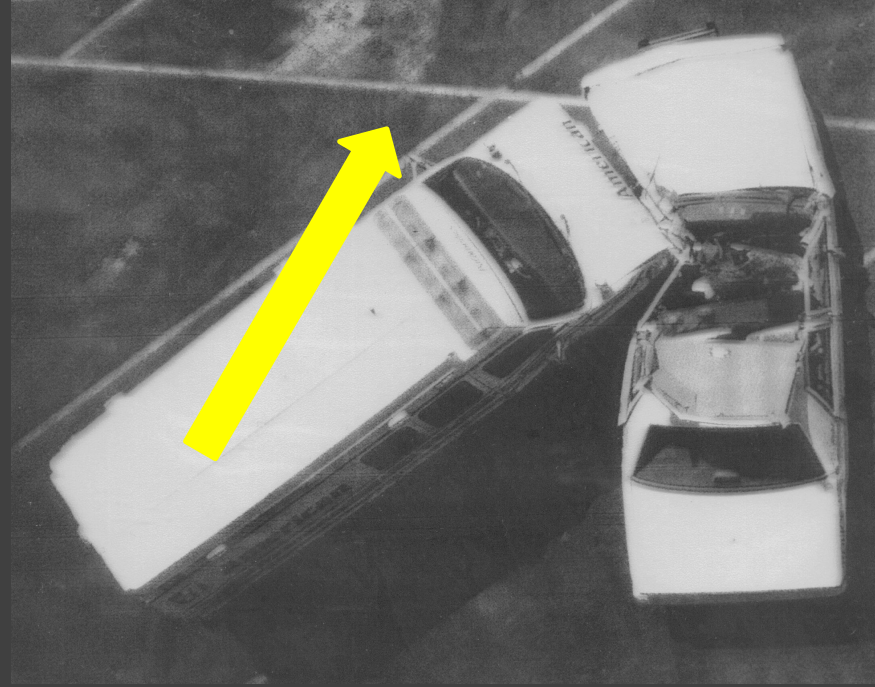








“The whole front  
end of the van  
was crushed in.”



eye witness







# REINFORCING A WITNESS OBSERVATION



strengthening a witness observation





WITNESSES MAY  
SAY THINGS THAT  
THEY DIDN'T EVEN SEE





- “There was such a difference in damage. It had to be because of the **speed of the truck.**”
- “There was such a difference in the damage to the car and the truck. It had to be because the truck was **going so fast.**”
- “The whole side of the car was crushed in. That had to be because of the **excessive speed** of the truck.”

medical & emergency  
personnel

impairment?

operation?



Do you know who they are?



# EDR

(Event Data Recorder)

WARRANT ?

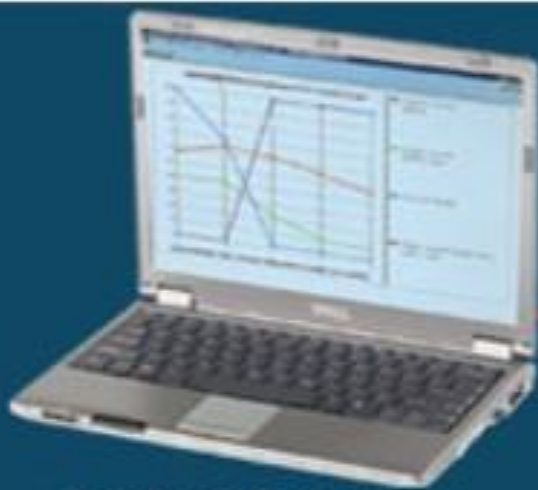
AIRBAG CONTROL  
MODULE (ACM)

ENGINE CONTROL  
MODULE (ECM)

EVENT DATA  
RECORDER (***EDR***)

DRIVETRAIN CONTROL  
MODULE (DCM)





**Notebook Computer**



**Crash Data  
Retrieval System**

**CDR**



**Air Bag  
Control Module**







data download from diagnostic port



EDR

*vehicle behavior*

*operator behavior*

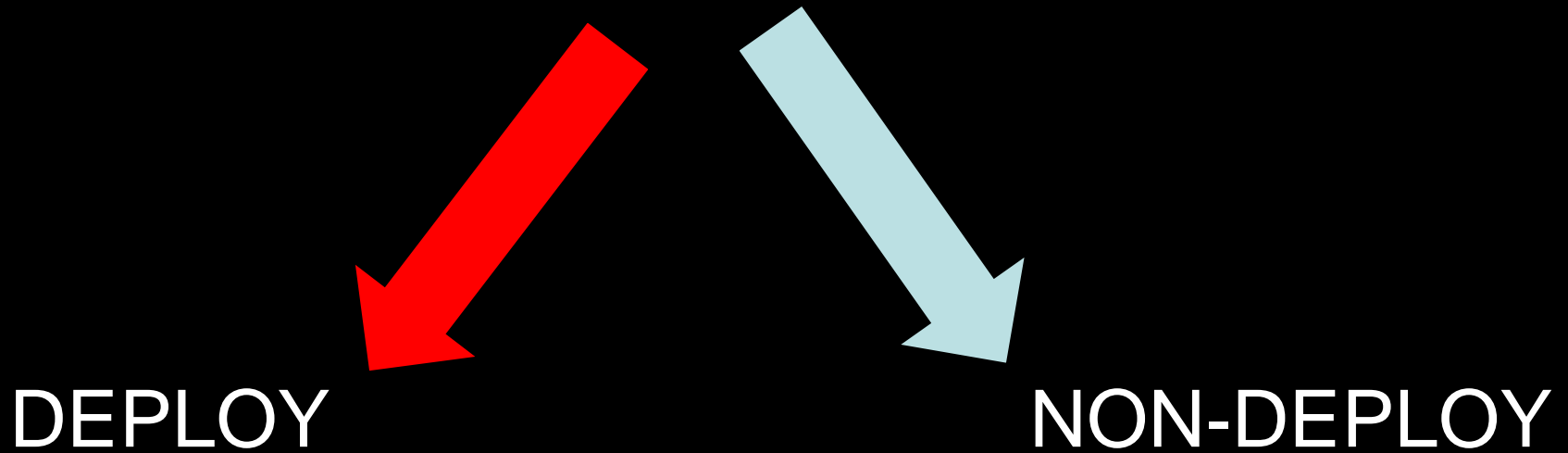


# Possible EDR data:

- brake applied
- % braking
- % throttle
- steering angle
- speed
- delta-V (  $\Delta V$  ) - change in velocity
- restraint use
- occupant data (weight, location)
- newer EDR's may capture multiple events



# COLLISION EVENTS



## *Deploy event:*

Data is stored permanently

## *Non-deploy event:*

- Temporary
- Erased after 250 ignition cycles\*\*\*
- May be overwritten by another non-deploy event (intentionally ?)
- Is not overwritten by simply driving the vehicle
- May record data in a pedestrian strike

Wheel speed may not be the same as the vehicle speed, and if that happens...

the wheel speed sensors may produce erroneous speed data:

- airborne motion

- tire has lost traction

- wheel size was changed

# Ignition cycles counter



**CDR** CRASH DATA  
RETRIEVAL

## System Status At Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
Passenger SIR Suppression Switch Circuit Status (if equipped)	Air Bag Not Suppressed
Ignition Cycles At Deployment	5947
Ignition Cycles At Investigation	5948
Maximum SDM Recorded Velocity Change (MPH)	-35.48
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	95
Time Between Non-Deployment And Deployment Events (sec)	N/A
Time From Algorithm Enable to Deployment Command Criteria Met (msec)	2.5





## System Status At Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	BUCKLED
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Time Between Non-Deployment And Deployment Events (sec)	N/A
Time From Algorithm Enable to Deployment Command Criteria Met (msec)	2.5

# Speed chart from report

Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle
-5	65	1856	33
-4	63	1856	33
-3	63	1792	33
-2	61	1728	0
-1	57	1664	0

0 ← collision

## Speed chart from report

**newer vehicles may show data  
in 1/10 sec intervals**

**Seconds  
Before AE**

-5

-4

-3

-2

-1

**Vehicle Speed  
(MPH)**

57

1856

1792

1728

1664

**Percent  
Throttle**

33

33

33

0

0





➡ hexadecimal data ➡ cdx. file

Retrieving data from the EDR is called “imaging” (the data is not removed from the EDR)

An EDR report can be edited with pdf software, but the cdx. file cannot be changed

The EDR report should not be a  
“stand alone” document. It should  
be supported by:

crash reconstruction

witness testimony

vehicle(s) damage

speedometer/tachometer data

other evidence (including video)

Prosecutors:

***QUALIFICATIONS  
OF YOUR EDR  
WITNESS***

# CRASH DATA RETREIVAL (CDR) CERTIFICATION:

**TECHNICIAN** - the technology and mechanics of downloading the CDR data

**ANALYST** – interpretation of the EDR data  
(requires several additional days of training)



Prosecutors:

***EDR WAS  
DOWNLOADED  
WITH OLD  
SOFTWARE***

PRIOR TO TRIAL:

DOWNLOAD THE FILE WITH  
THE NEWEST VERSION  
OF THE SOFTWARE

PRIOR TO TRIAL:

DOWNLOAD THE FILE WITH  
THE NEWEST VERSION  
OF THE SOFTWARE

THE NEWER VERSION  
MAY CORRECT A PRIOR  
PROBLEM, BUT THE DATA  
WILL NOT CHANGE

other

digital evidence



# *Sources of digital evidence:*

---

- EDR (event data recorder)
- Cell phones - contents/tower “pings”
- Infotainment center in vehicle
- Social networking
- GPS devices
- Sport watches
- Security, surveillance video
- Personal in-car video (fleet vehicles)



# EVIDENCE FROM CELL PHONES *and* GPS's

Universal Forensic Extraction Device  
**Celebrite.com**



# EVIDENCE FROM CELL PHONES

Riley v. California

US Supreme Court, 2014  
Police generally need a warrant  
to search a cell phone.

# infotainment center



[www.berla.co](http://www.berla.co)

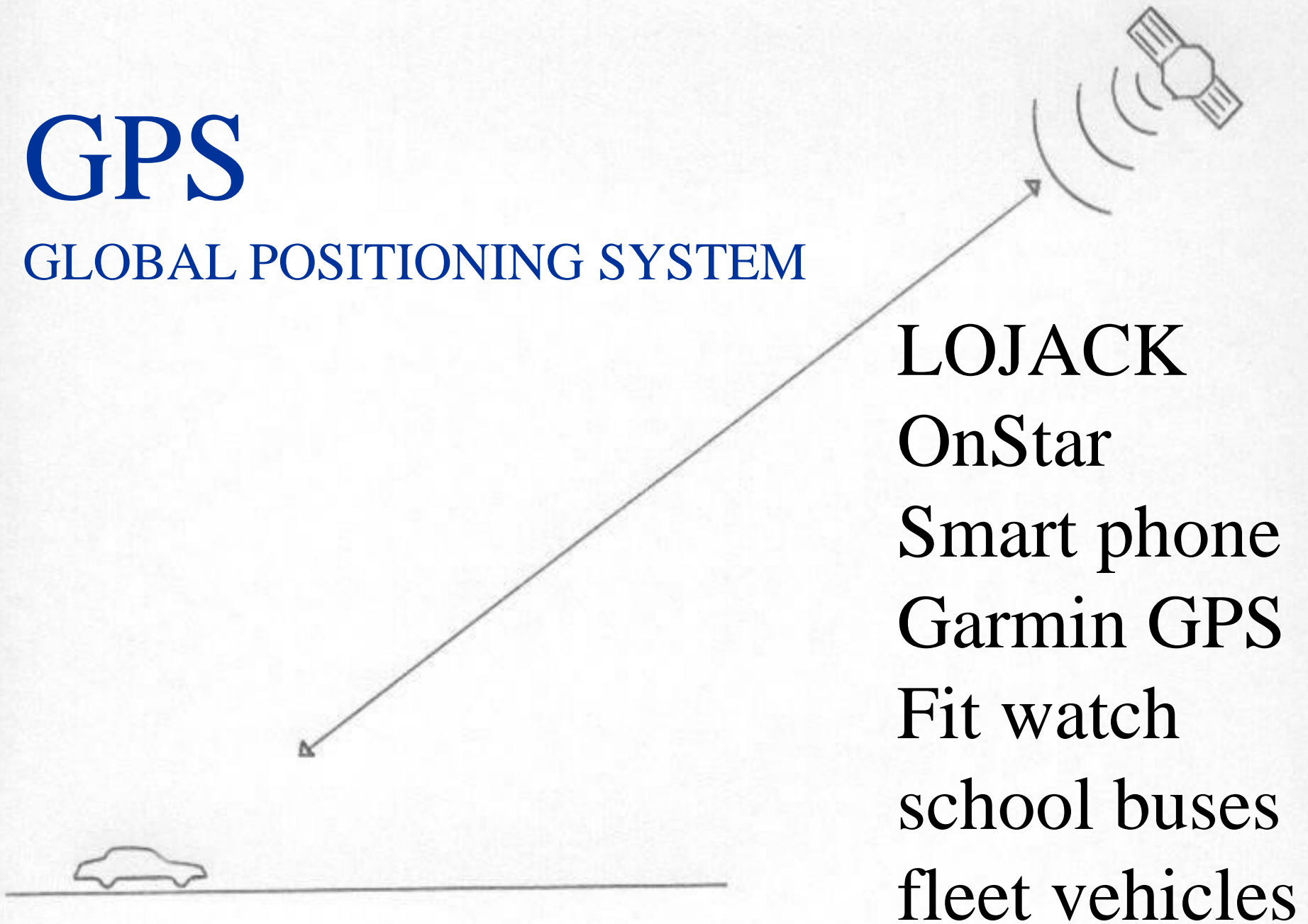




Bluetooth system in car may  
capture phone history and  
address book.

# GPS

GLOBAL POSITIONING SYSTEM





## Garmin portable GPS

24 hours of data speed every second  
downloadable with **Cellebrite**

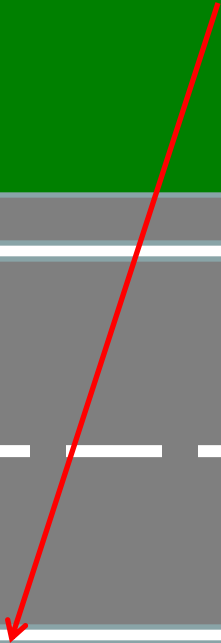
# Garmin Forerunner 210 sport watch

Throw distance  
from GPS data?

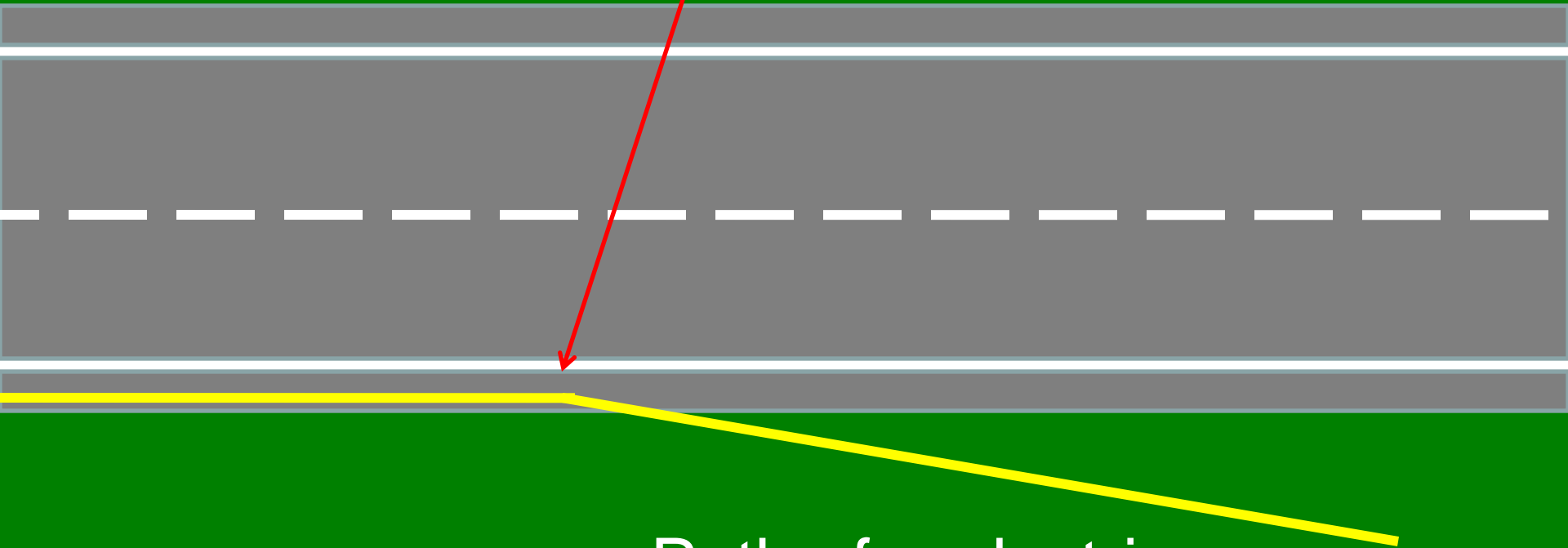




point of impact



Path of pedestrian



A new source of digital data:

Insurance driver behavior  
monitoring



video evidence



ROH NOCL 01



# in-car video





traffic camera

# personal dash cameras (inexpensive)



photography

“A picture is worth a thousand words”.

does the jury see the same picture of  
your case that the prosecution sees?

do all the jurors have the same picture?

how can you help them?



# identification placard



## Collision Investigation Squad



Date:

2/7/17 (original 2/1/17)

Precinct:

045

Case #:

317-05a (045 Pet Garage)

Technician:

PO ZAREK

# The Scene





# final rest position ( FRP )



San Antonio P.D.



# area of impact



San Antonio P.D.



point of impact







SKID MARKS  
LOCKED WHEEL BRAKING  
(OLDER CARS)



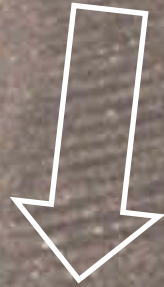


skid marks"

ABS "scuff marks"



yaw – wheel is turning,  
and slipping sideways



yaw  
“striations”

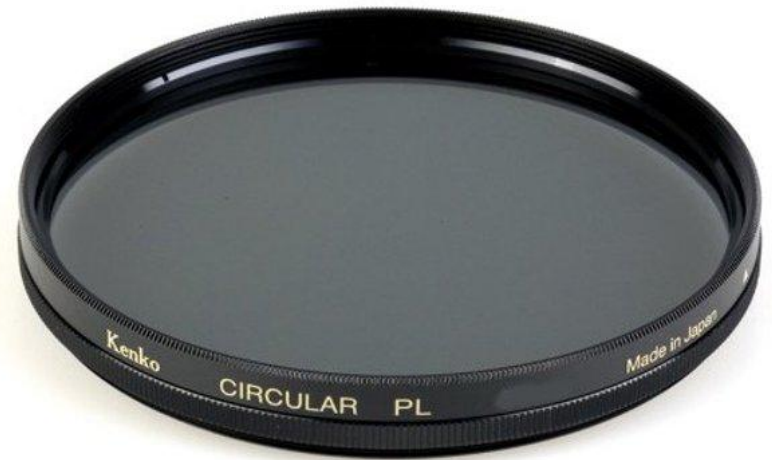


Do you see the tire  
marks on the road?





Would \$ 9.90 at the local Walmart  
be a good investment?



polarizing filter

Do you see the tire marks on the road?

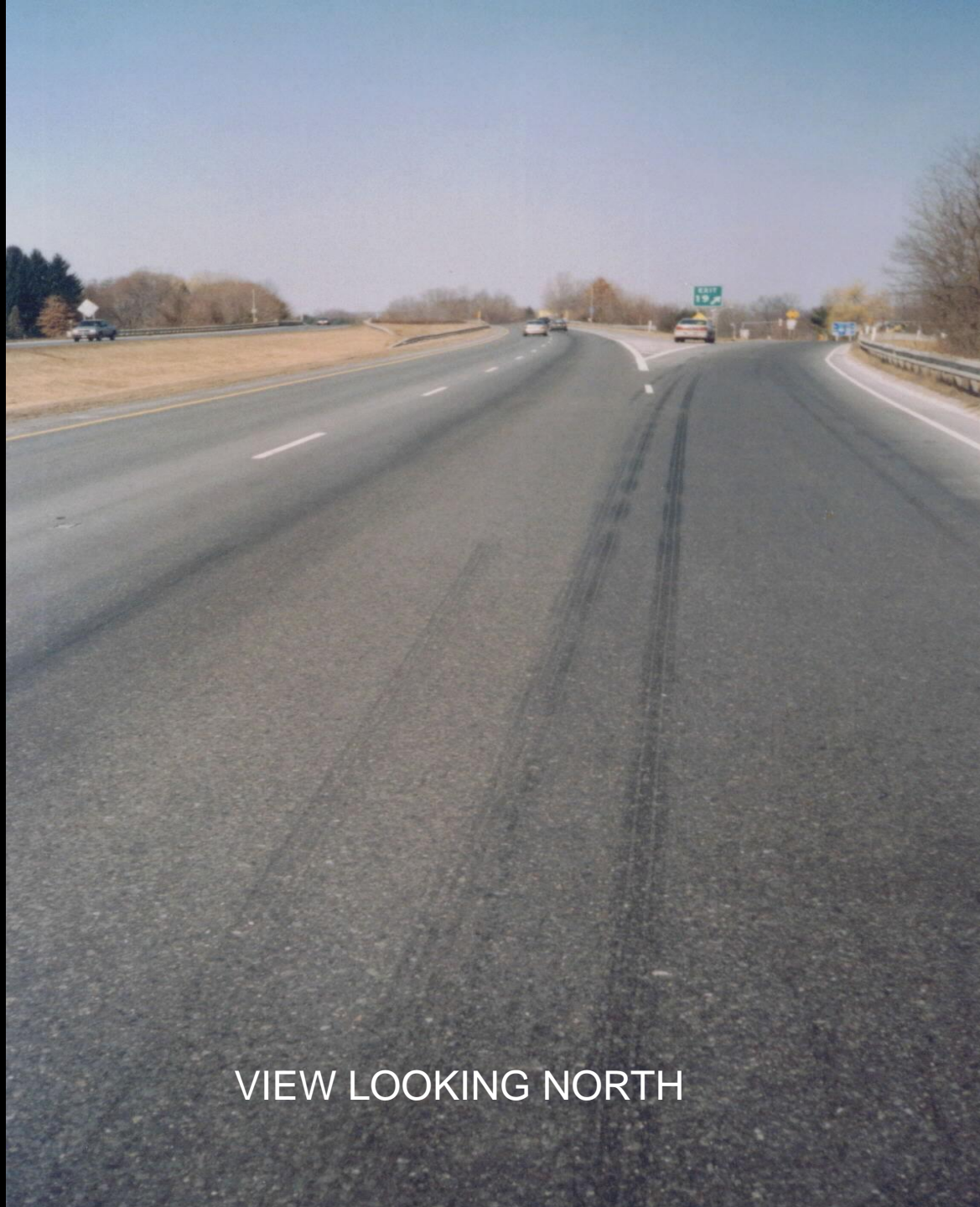




with a polarizing filter

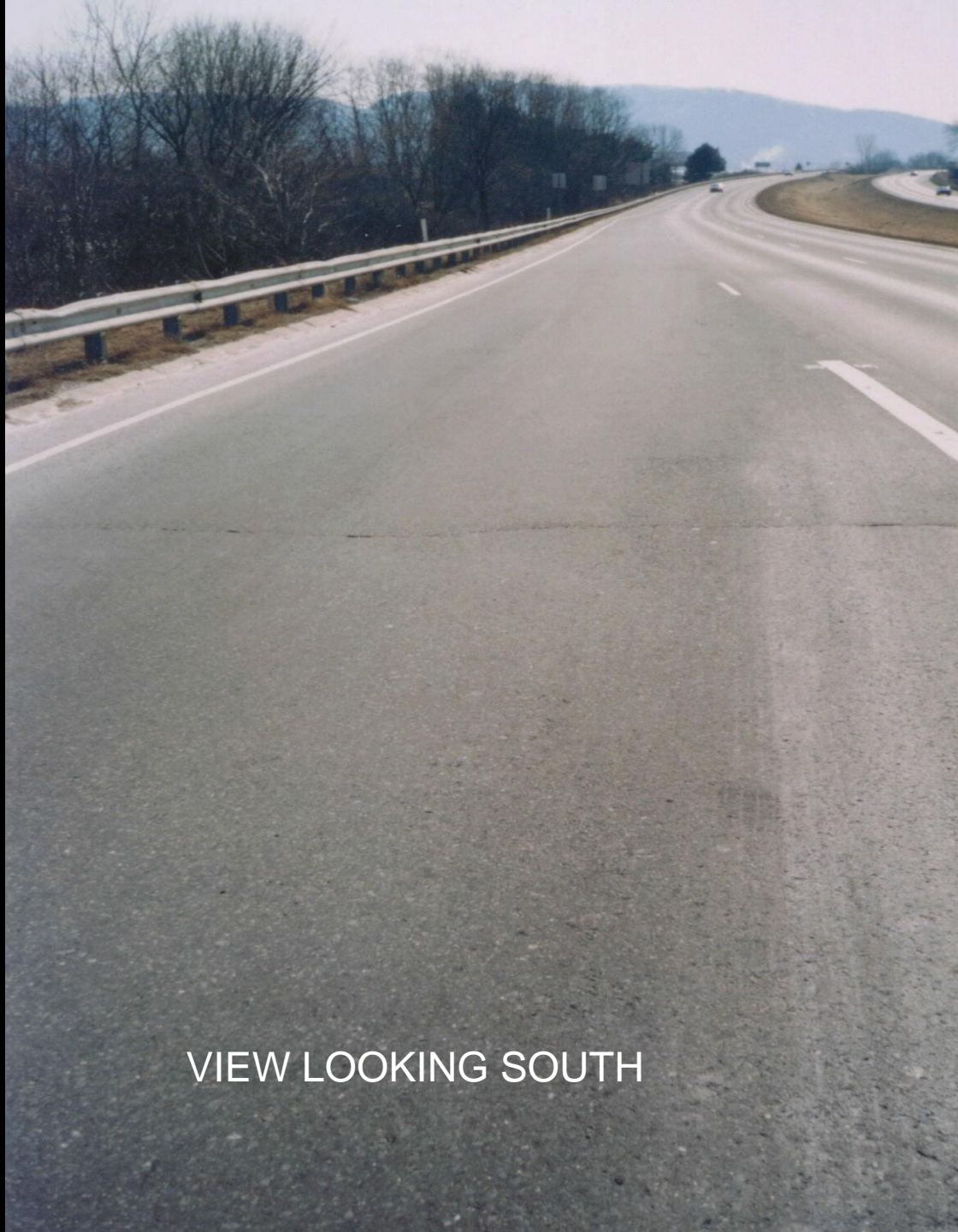






VIEW LOOKING NORTH



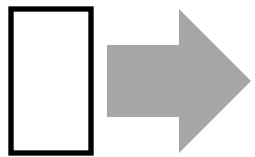


VIEW LOOKING SOUTH

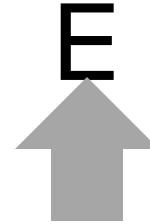
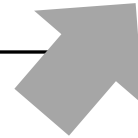
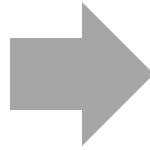


What is this?





camera



“APPROACH AND SHOOT”


















A night photograph of a road. The road is dark asphalt, and a white line runs along the right edge. To the right of the road is a grassy area with some dry leaves. A tire mark is visible on the road surface, near the white line. The text "night photography" is written in white, serif font in the upper right corner. Below it, the text "Can you see the tire mark?" is written in the same font.

# night photography

Can you see the  
tire mark?

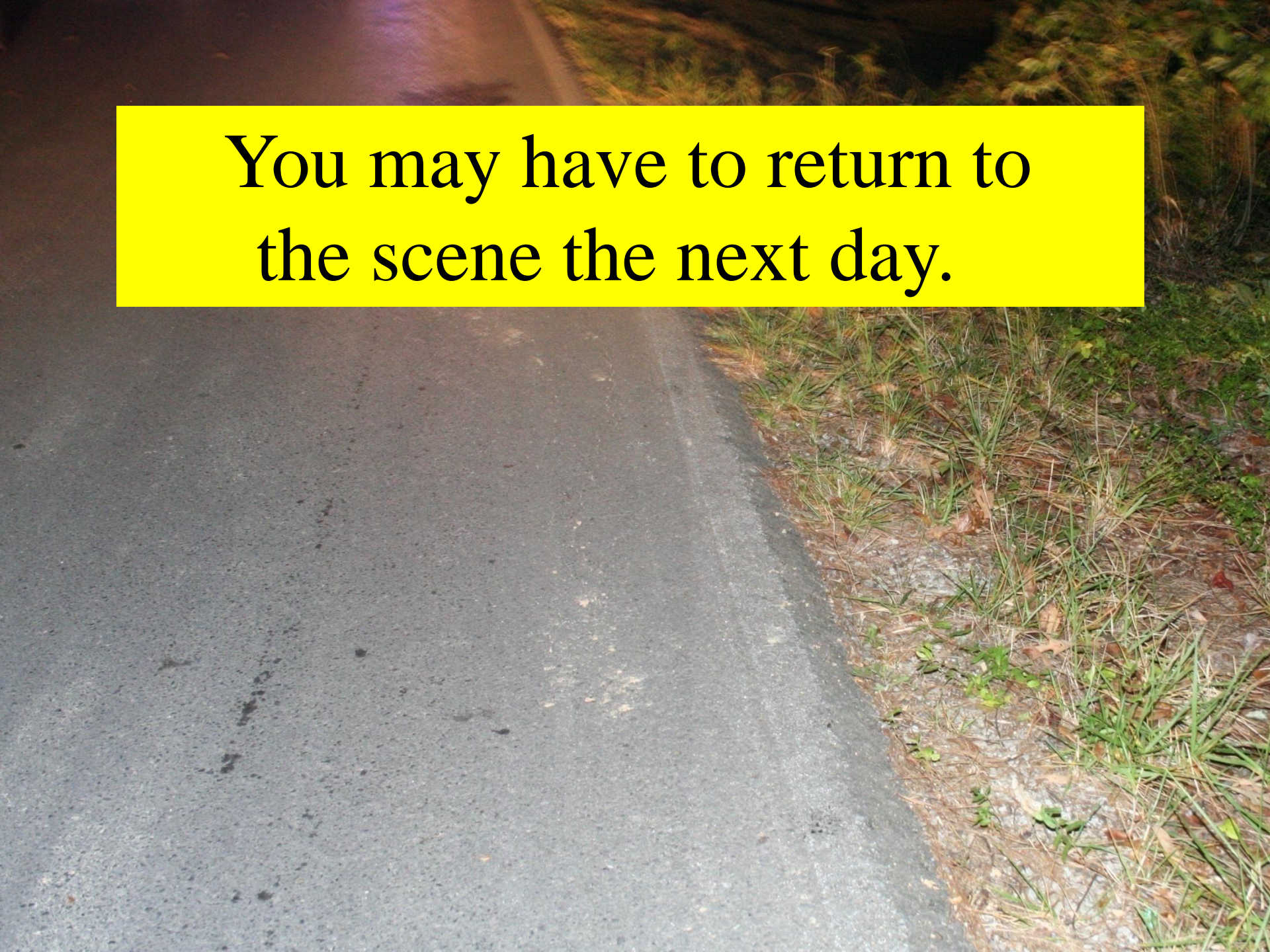


A photograph of a road at night, illuminated by a light source from the left, creating a bright reflection on the asphalt. The road curves to the right, bordered by grass and foliage. A yellow rectangular box is overlaid on the image, containing black text.

Check your photos before  
you leave the scene.

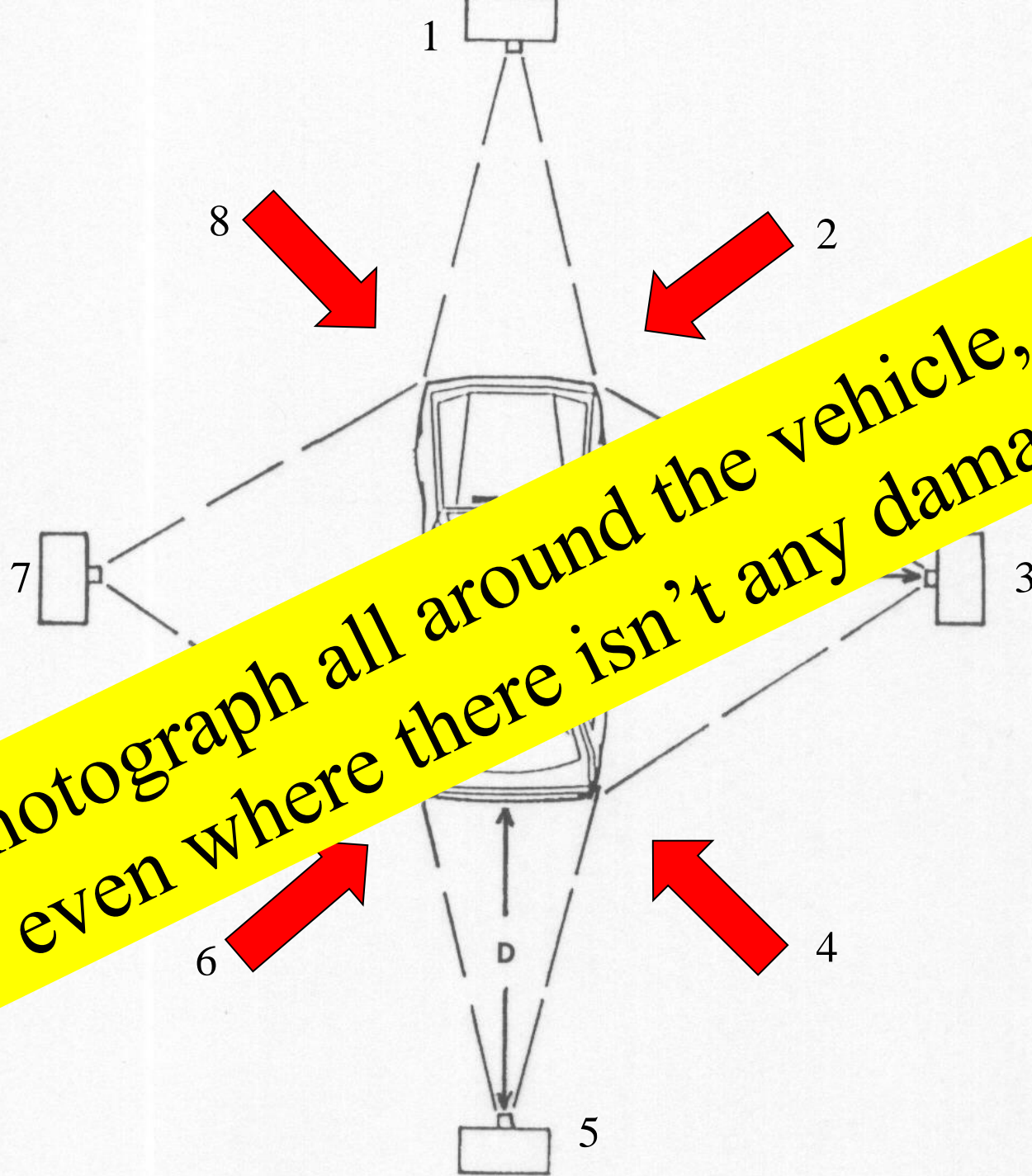


You may have to return to  
the scene the next day.





Photograph all around the vehicle,  
even where there isn't any damage.

















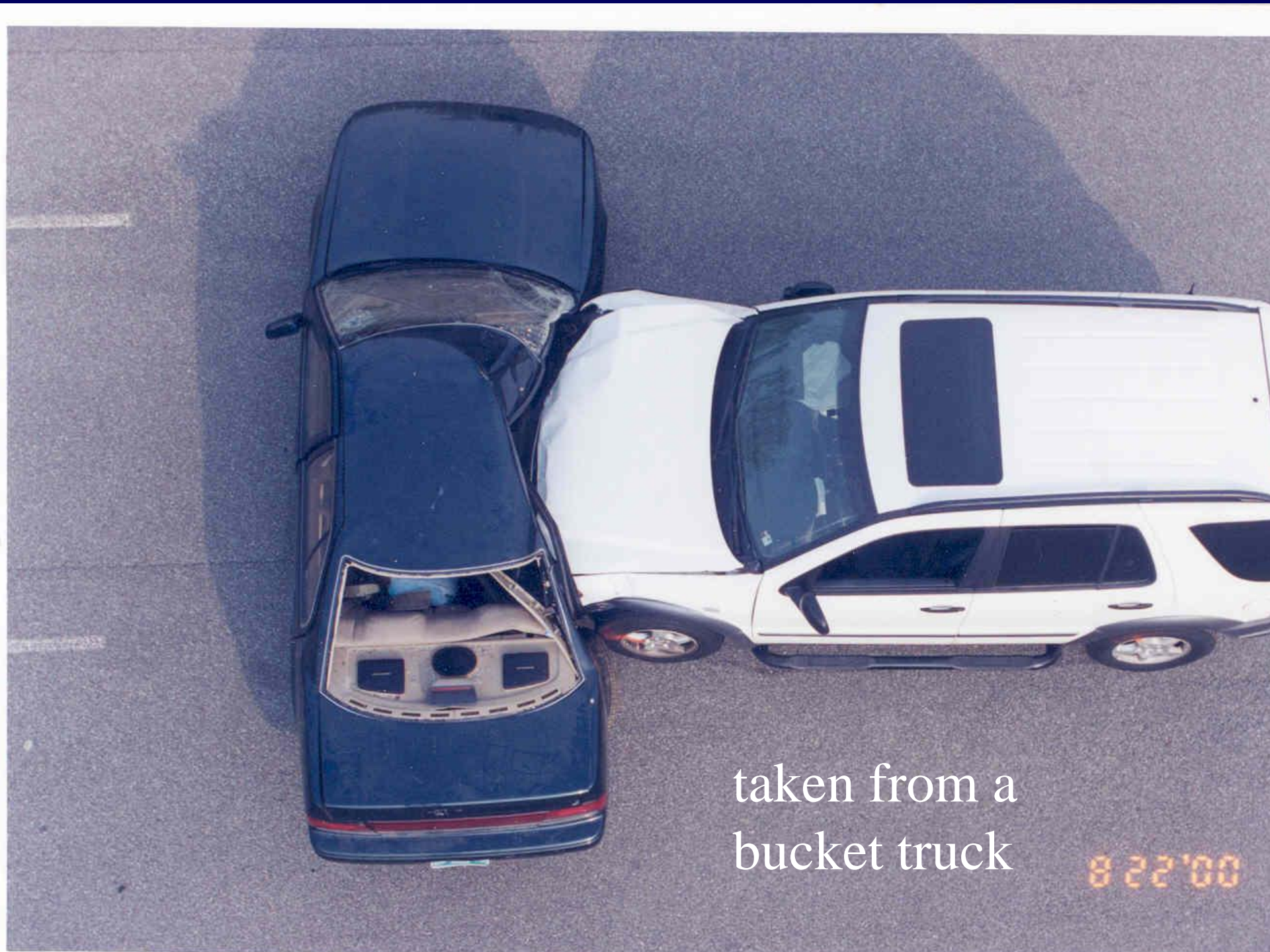


taken from a  
bucket truck





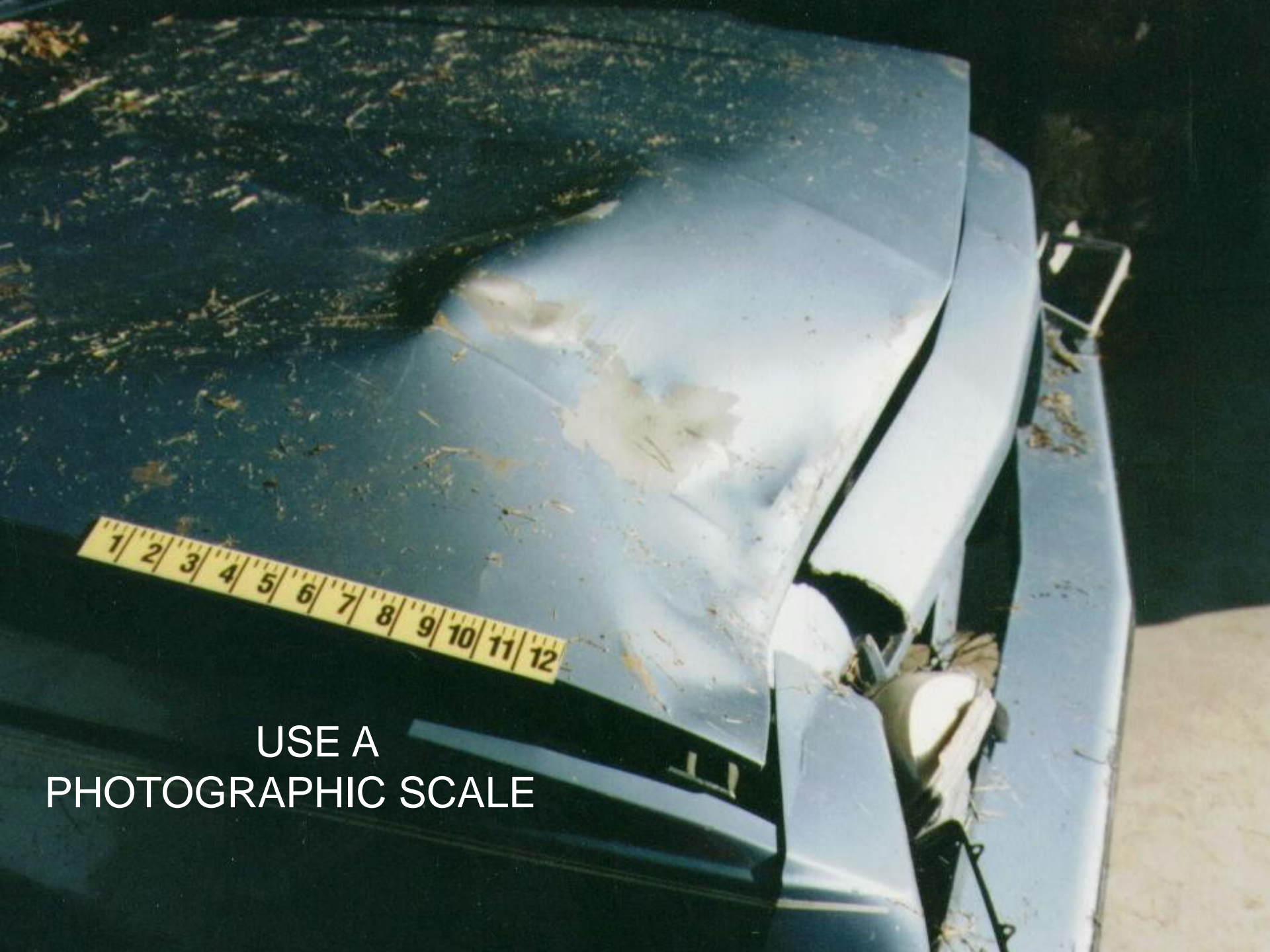




taken from a  
bucket truck

8:22'00





USE A  
PHOTOGRAPHIC SCALE





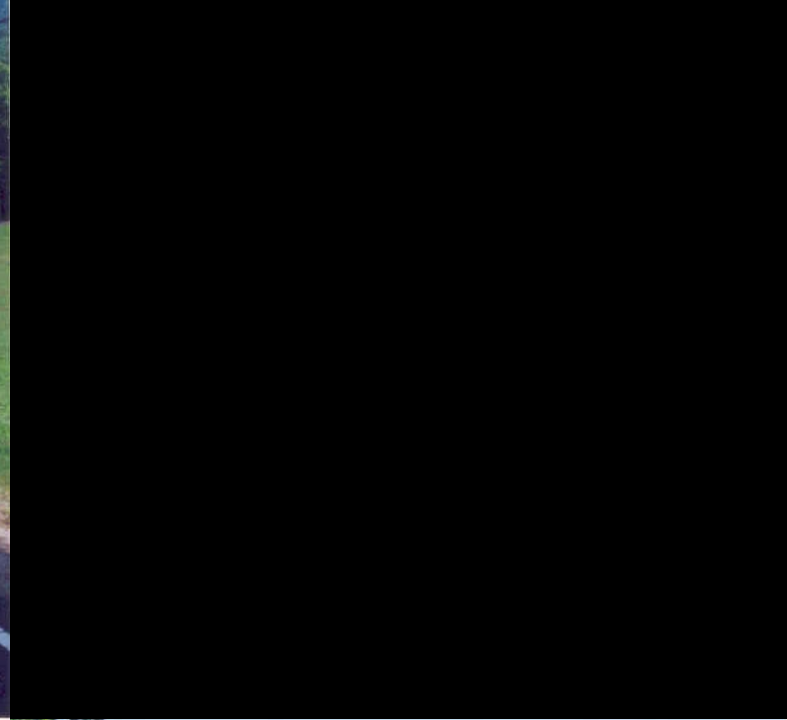
EVIDENCE TENTS

perspectives  
of operator(s) and witnesses





driver's  
perspective  
(good photo)



driver's  
perspective  
(bad photo)



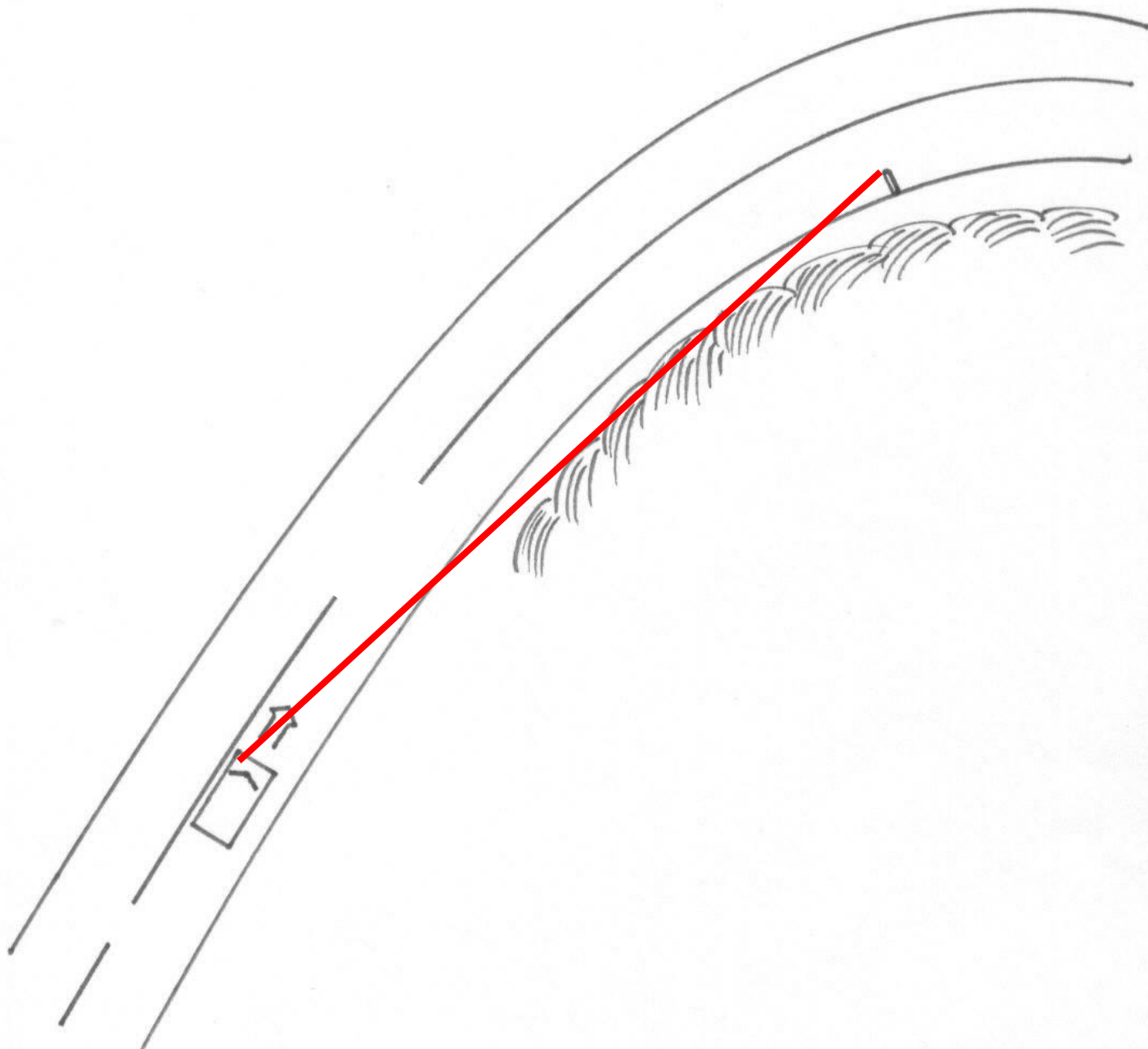




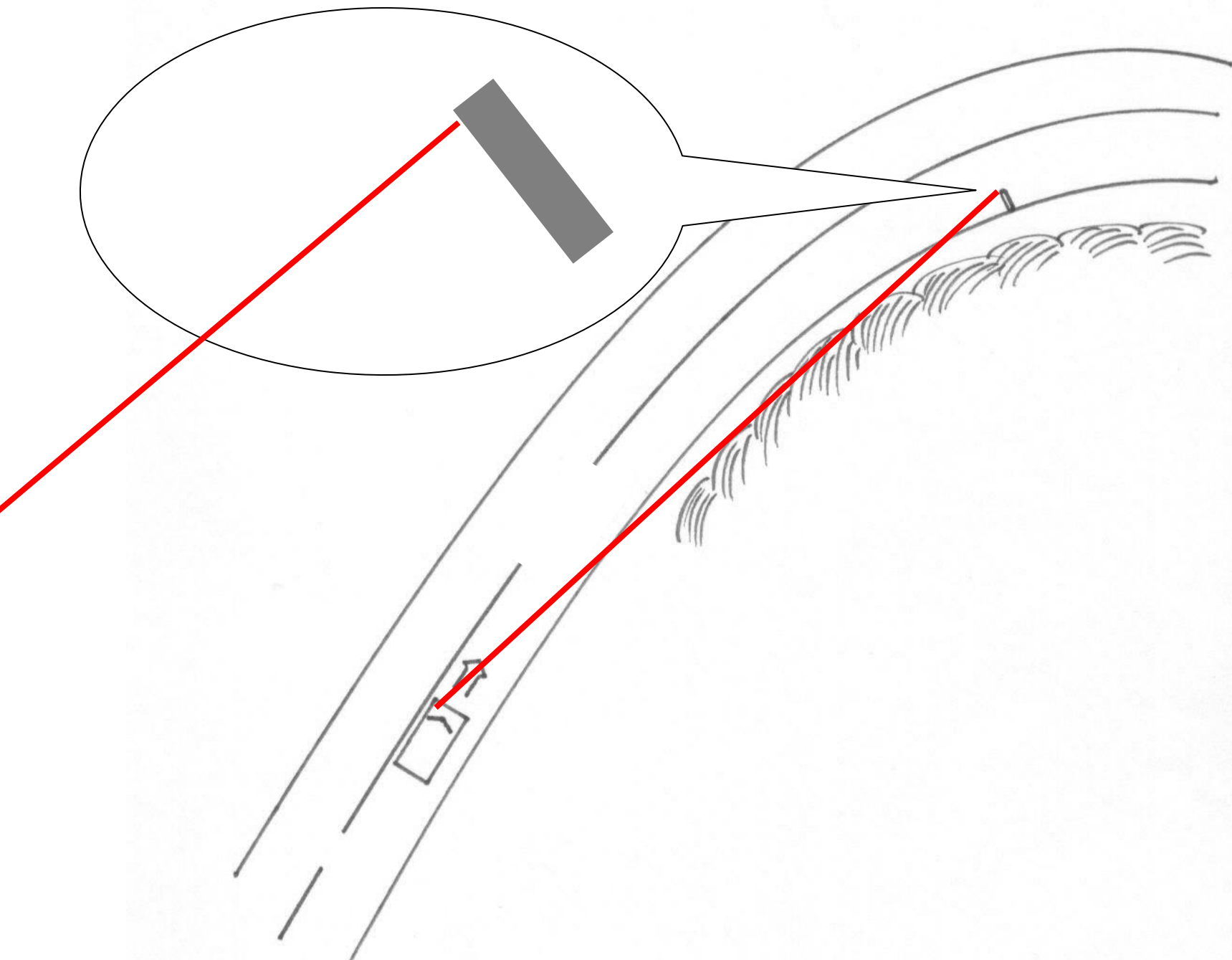


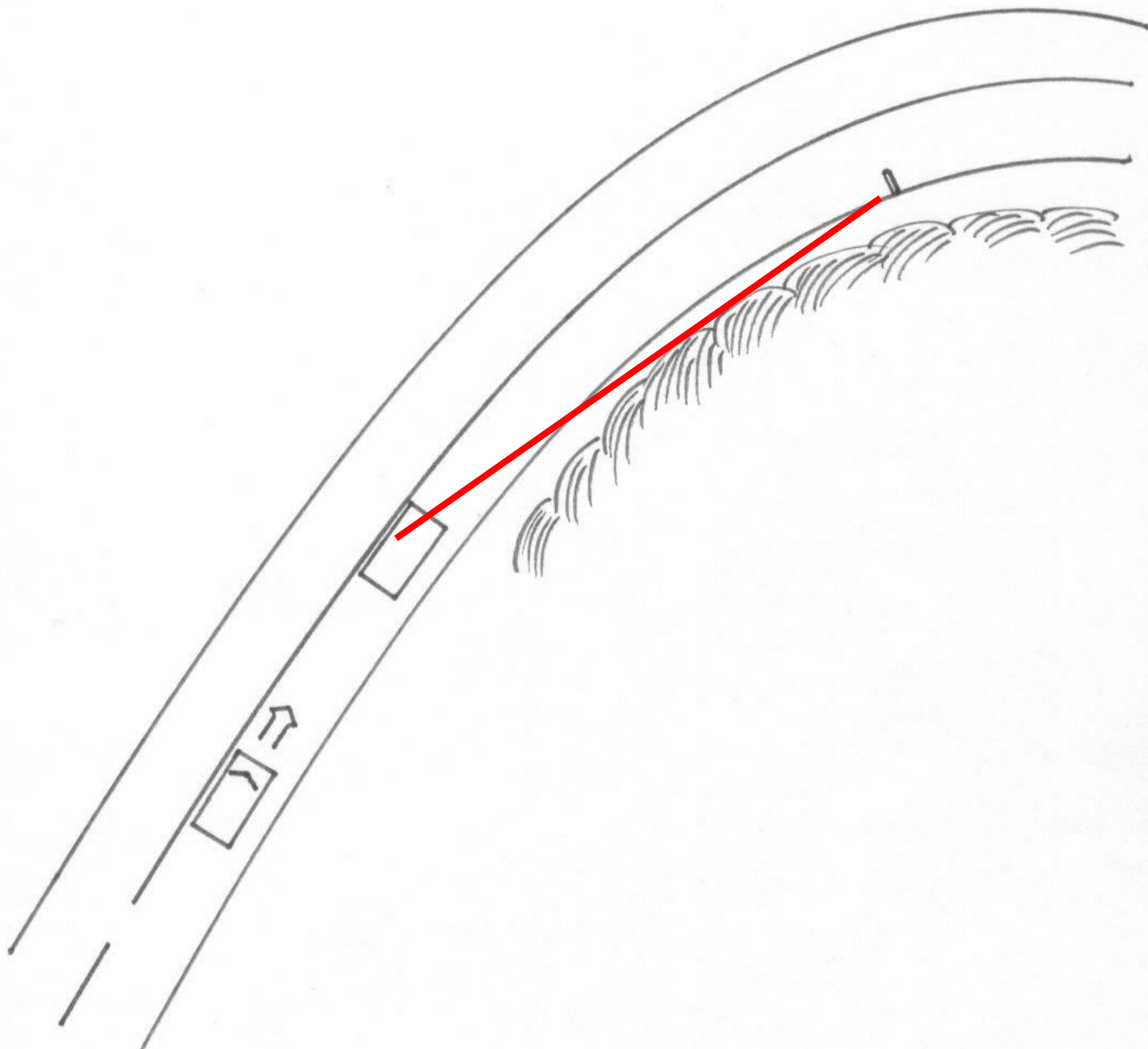
Did you see the pedestrian?

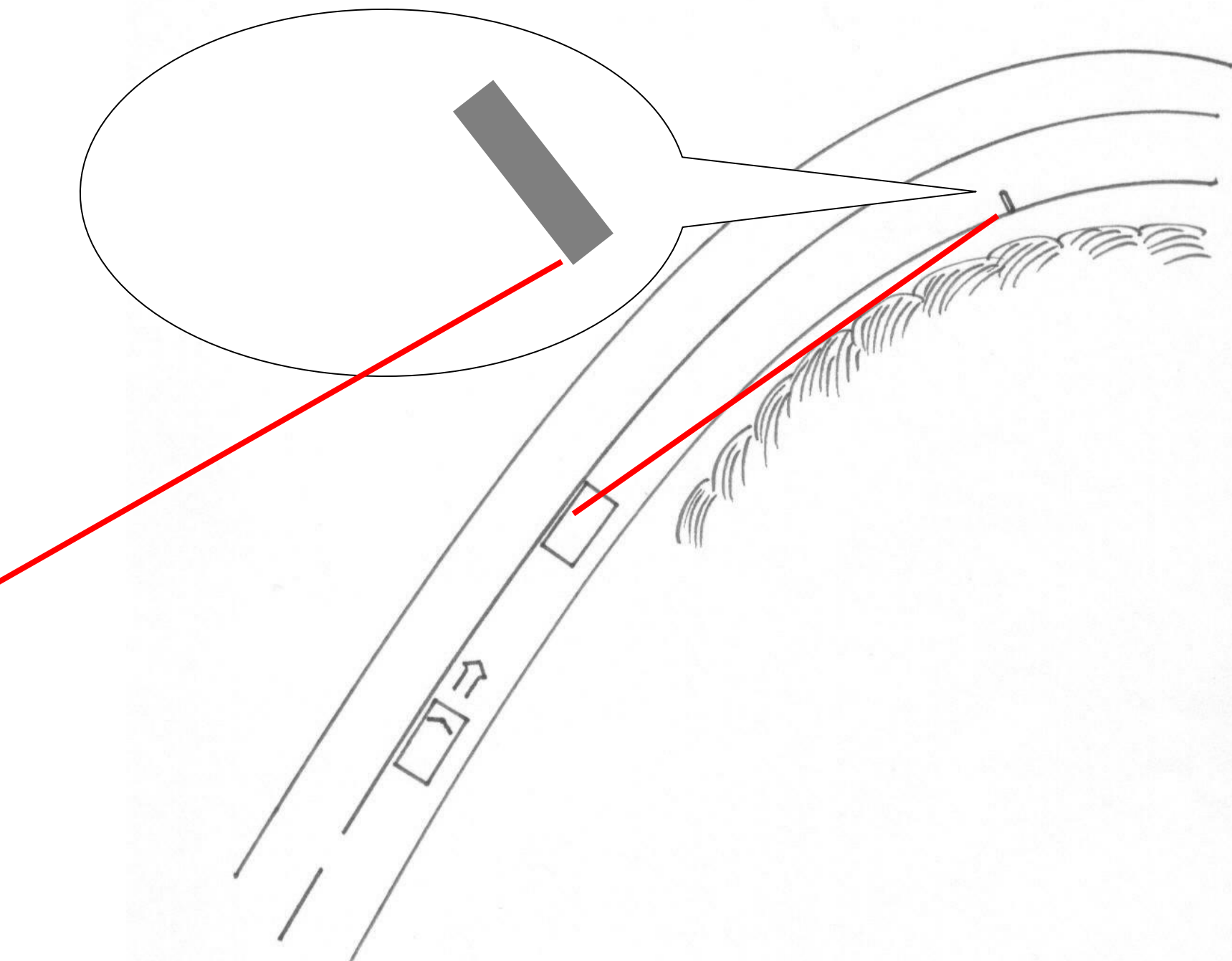














witness perspective



mechanical failure





WAS MECHANICAL FAILURE THE CAUSE?



A mechanical causation  
defense may not surface until  
well after a crash...



CHECK FOR  
***RECALLS***  
ON ALL VEHICLES !

CHECK FOR  
***RECALLS***  
ON ALL VEHICLES !

[www.NHTSA.gov/recalls](http://www.NHTSA.gov/recalls)  
*and click on VEHICLE*



A pickup truck suddenly swerves off the road and strikes a tree – killing the passenger in the truck. The impaired operator is charged!

A pickup truck suddenly swerves  
off the road and strikes a tree –  
killing the passenger in the truck.  
The impaired operator is charged!

**A SURPRISE:**

**TWO WEEKS BEFORE TRIAL**

The prosecutor finds that the truck had a recall that could be causative.



## **SUMMARY:**

CERTAIN FEDERAL-MOGUL REPLACEMENT WHEEL

HUB ASS

CARQUE

515059, A

and/or wheel separation

AND DECEMBER 20, 2007, SOLD FOR

MEDIUM DUTY TRUCKS. THE INBOARD ATTENTION NUT

USED TO MAINTAIN HUB BEARING ASSEMBLY CAN

LOOSEN RESULTING IN AN ABS LIGHT INDICATION,

NOISE, AND/OR WHEEL SEPARATION.

## **CONSEQUENCE:**

WHEEL SEPARATION CAN RESULT IN A VEHICLE CRASH.

vehicle slows to exit the highway  
and suddenly tips over







TRUCKS WERE BUILT  
WITH INCORRECT REAR  
BRAKE ASSEMBLIES.

CONSEQUENCE OF DEFECT:

A TENDENCY FOR REAR BRAKE LOCKUP  
EXISTS, PARTICULARLY WITH A LIGHTLY  
LOADED TRUCK.

To see if a recall has been repaired  
for vehicle years > 2000

[vinrcl.safercar.gov/vin/](http://vinrcl.safercar.gov/vin/)



CHECK FOR

***TSB's***

***( TECHNICAL SERVICE  
BULLETINS )***

***manufacturer's communications***

***[www.NHTSA.gov/recalls](http://www.NHTSA.gov/recalls)***

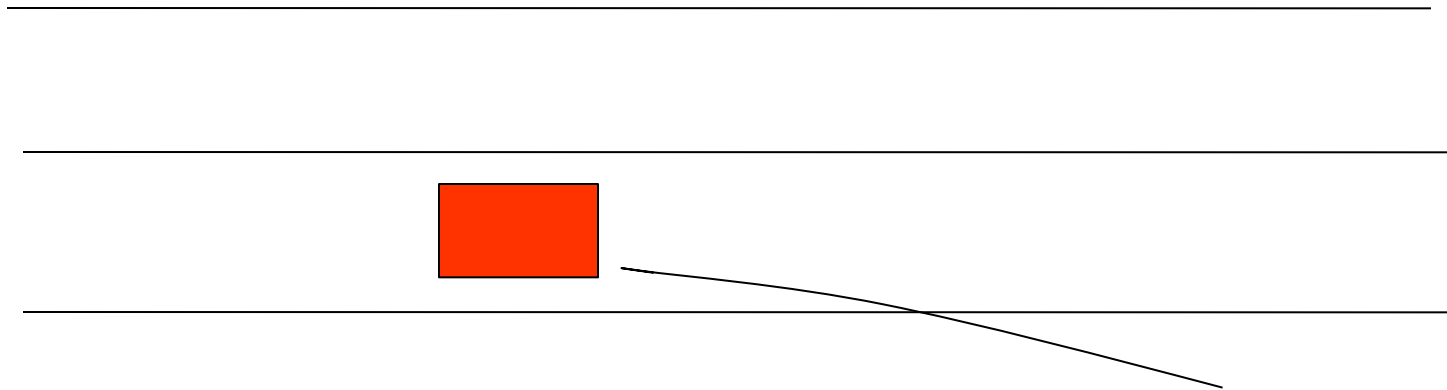
***and click on VEHICLE***

CHECK FOR  
***COMPLAINTS***

[www.NHTSA.gov/recalls](http://www.NHTSA.gov/recalls)

*and click on VEHICLE*

VEHICLE SUDDENLY STEERS TO  
RIGHT, COLLIDES WITH GUARDRAIL.

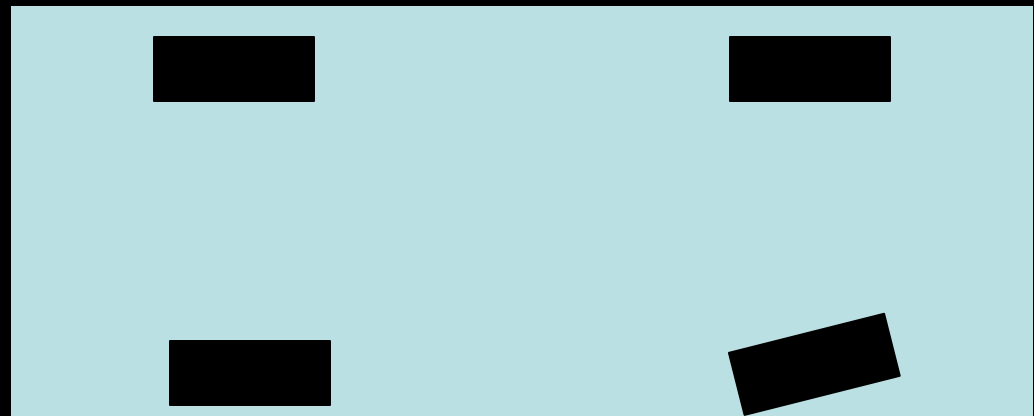








RF WHEEL  
TOED IN



# NHTSA complaint file:

- 845 complaints filed by owners of this vehicle
- More than 70 include language like:  
“when driving, right front wheel completely turned in”



# NHTSA complaint file:

- 845 complaints filed by owners of this vehicle
- More than 70 include language like:
  - “when driving, right front wheel completely turned in”
  - “subframe assembly on right front had rotted away, control arm assembly had separated from subframe”

# NHTSA complaint file:

- 845 complaints filed by owners of this vehicle
- More than 70 include language like:
  - ”when driving, right front wheel completely turned in”
  - “subframe assembly on right front had rotted away, control arm assembly had separated from subframe”
  - “right front tire was sideways, my mechanic said subframe had corroded”

*[www.NHTSA.gov/recalls](http://www.NHTSA.gov/recalls)*  
*and click on VEHICLE*



Don't forget about



secondary topics

vehicle  
impound



inspect the vehicle after transport



covered (if possible)

only supervised access



collision damage on rear bumper





damage caused at impound



# Who can release the vehicle?



# Testimony limited in homicide case

A judge ruled the state allowed evidence to be destroyed through negligence, not through bad faith.



Amanda L. King

cle homicide while under the influence and negligent operation will be in Superior Court Tuesday.

By LORI STABILE  
 lstable@repub.com

## NORTHAMPTON

commonwealth cannot present testimony from a state police accident reconstructionist in the motor vehicle homicide case against Amanda L. King because a key piece of evidence — the car — has been destroyed, a judge has ruled. The car King was driving, a 2008 Honda Civic, was destroyed by her insurer after the investigating officer testified it even though it was supposed to be kept as evidence, thus preventing the defense from examining it. The accident resulted in the death of Vanessa L. Kotowski, who was electrocuted as she stepped outside her friend's utility pole on a rainy night two years ago in Ware. Although the commonwealth is not claiming excessive speed contributed to the accident, its expert has opined in her report that the vehicle's possible speed for the commonwealth factor did not contribute to the type of testing that the defense seeks, including the forensic or mechanical analysis of the vehicle. "As the defendant's earlier statement that she felt the rear of the car shift as she was entering the curve raises the question of mechanical failure, there is a possibility that further testing done by the defense may have been fruitful," Hampshire Superior Court Judge Bertha S. A st-

The had asked for a dismissal of the case because his expert defects. While that was denied, Stogitis said he was pleased that the commonwealth is precluded from presenting the accident reconstructionist's testimony. Contacted Thursday, Stogitis called the ruling "a fair administration of justice under the circumstances." The commonwealth is alleging that King and Kotowski had been drinking alcohol. Bondsville Road when she attempted to navigate a turn and struck the pole, officials have said. "While neither the vehicle nor the utility pole were severely damaged by the accident, Ms. Kotowski, the utility pole's glass insulator dislodged and made contact with the pole's guy wire thereby electrifying the ground around the vehicle. Tragically, as Ms. Kotowski exited the vehicle, she was fatally electrocuted," Josephson wrote. The investigating officer who released the car never testified that the order for the car's destruction was issued.

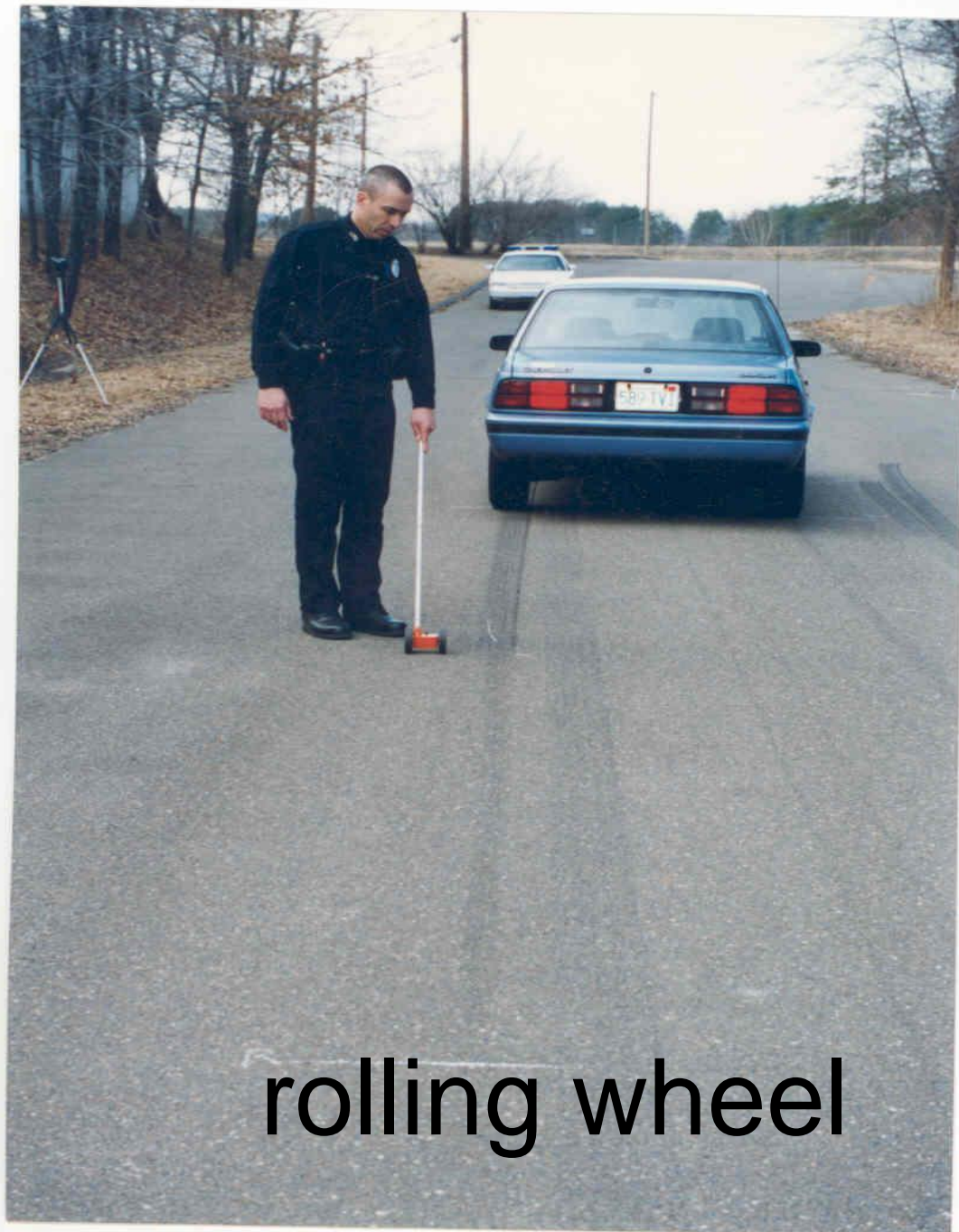
What can happen if the vehicle is released?



at scene  
measurements



drag sled



rolling wheel

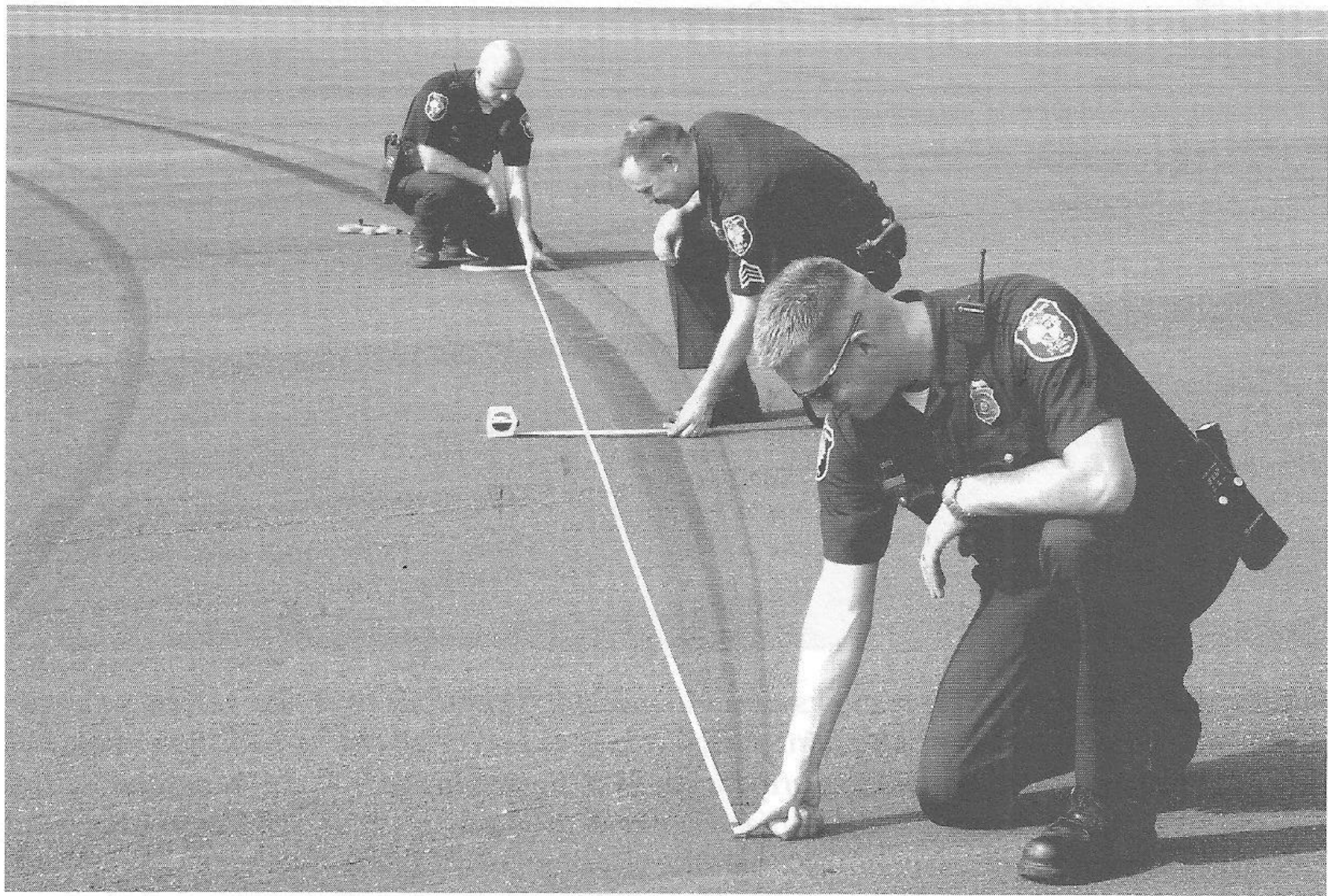




Does the bumper height  
match the injury?













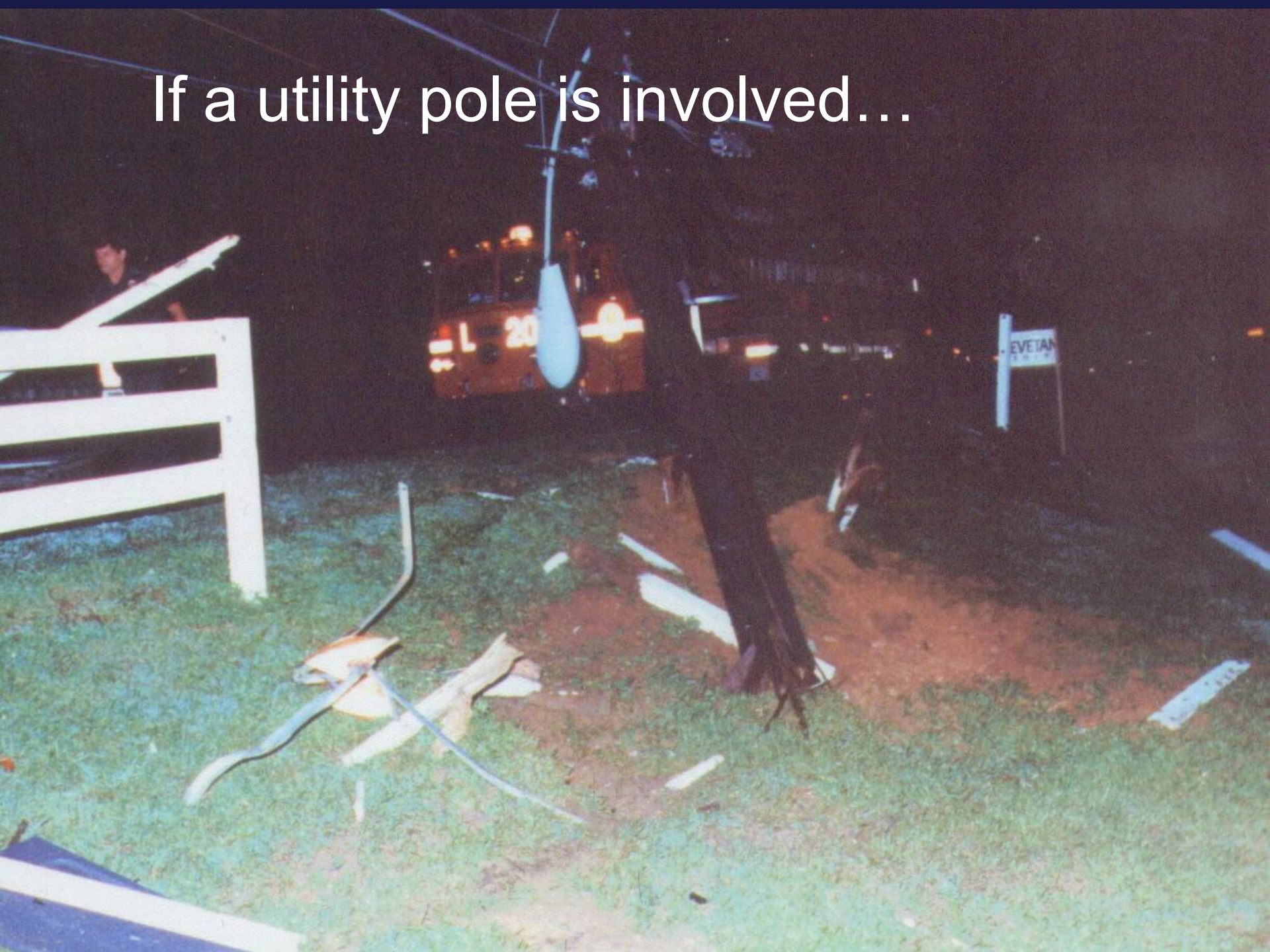


# Video Recording a Measurement



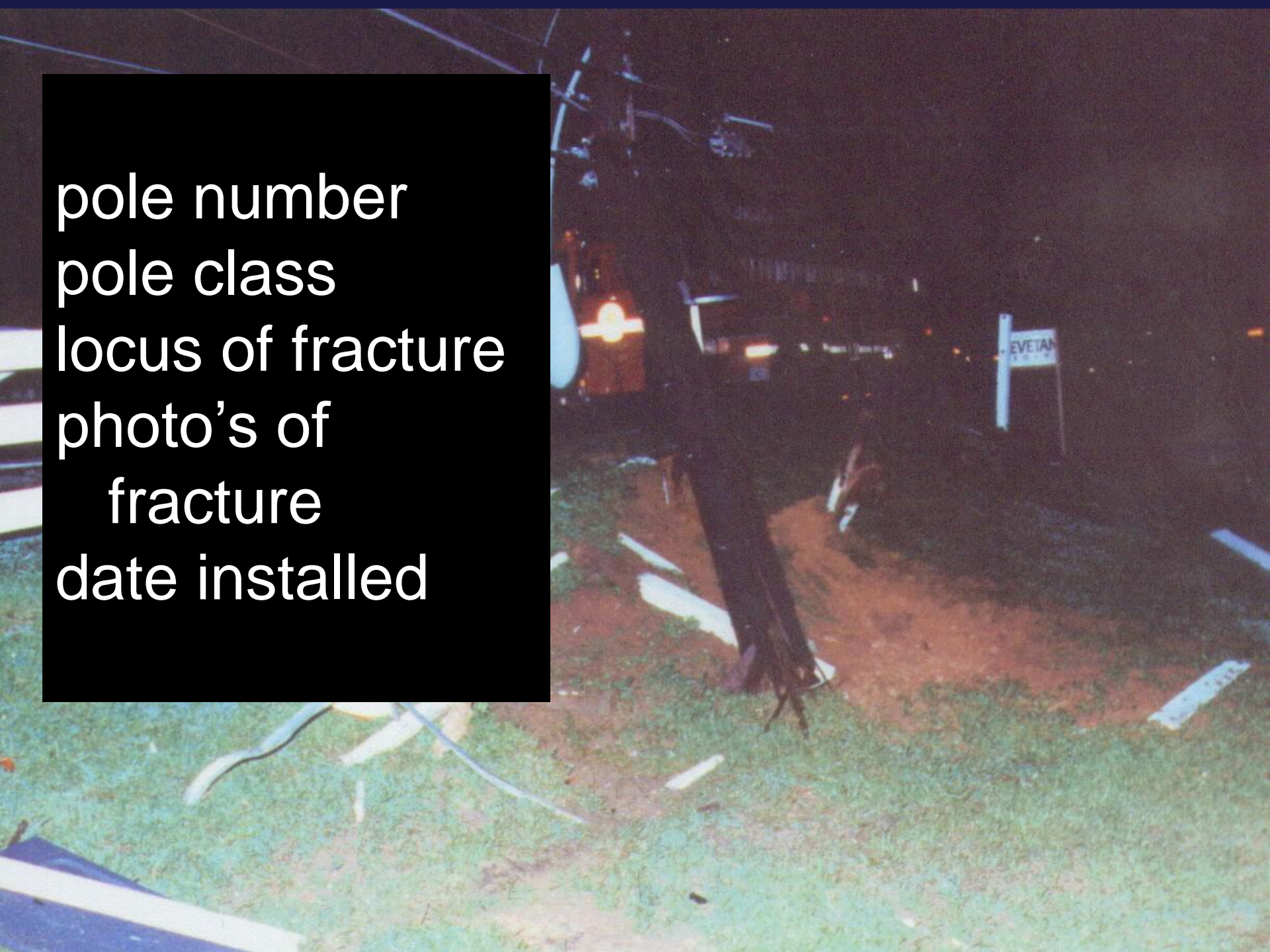


If a utility pole is involved...

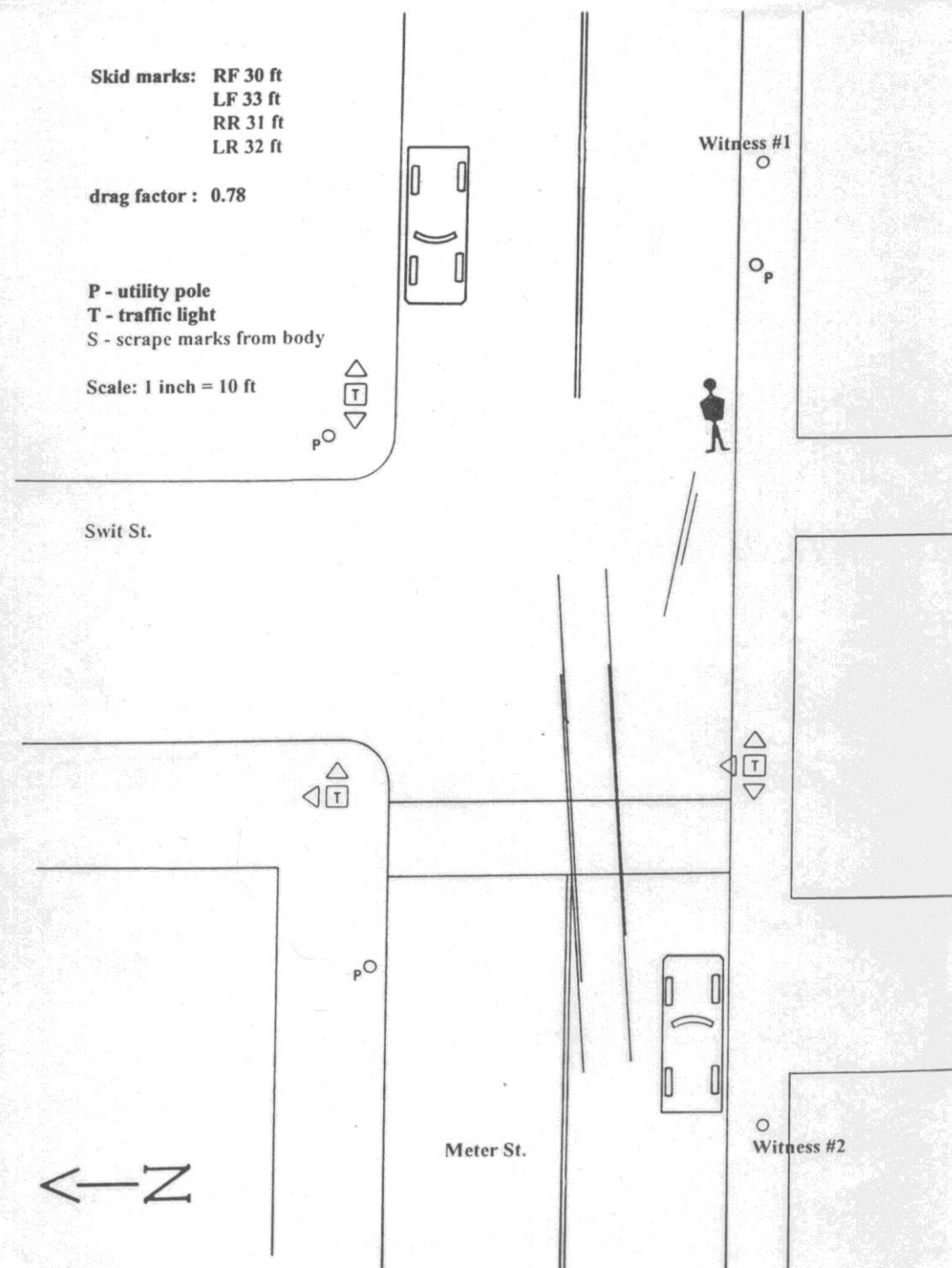




pole number  
pole class  
locus of fracture  
photo's of  
fracture  
date installed



Are parked  
vehicles well  
documented?





Matching the vehicle to the tire  
mark evidence:

tread pattern



5 ribs in pattern

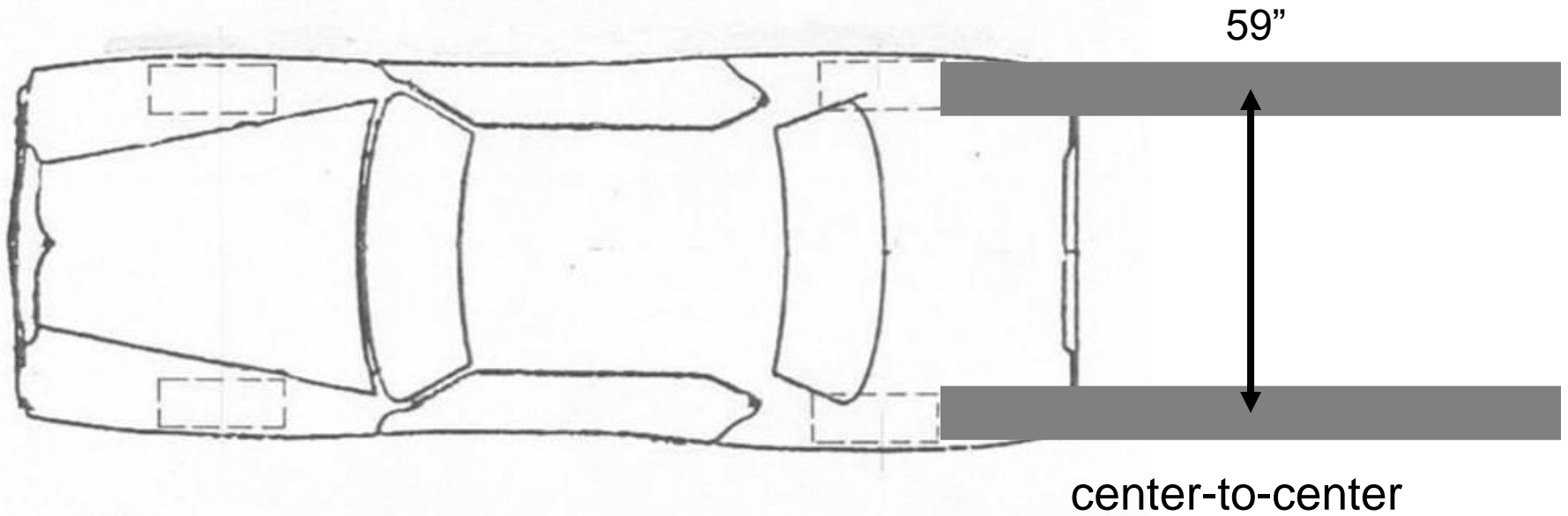
Matching the vehicle to the tire  
mark evidence:

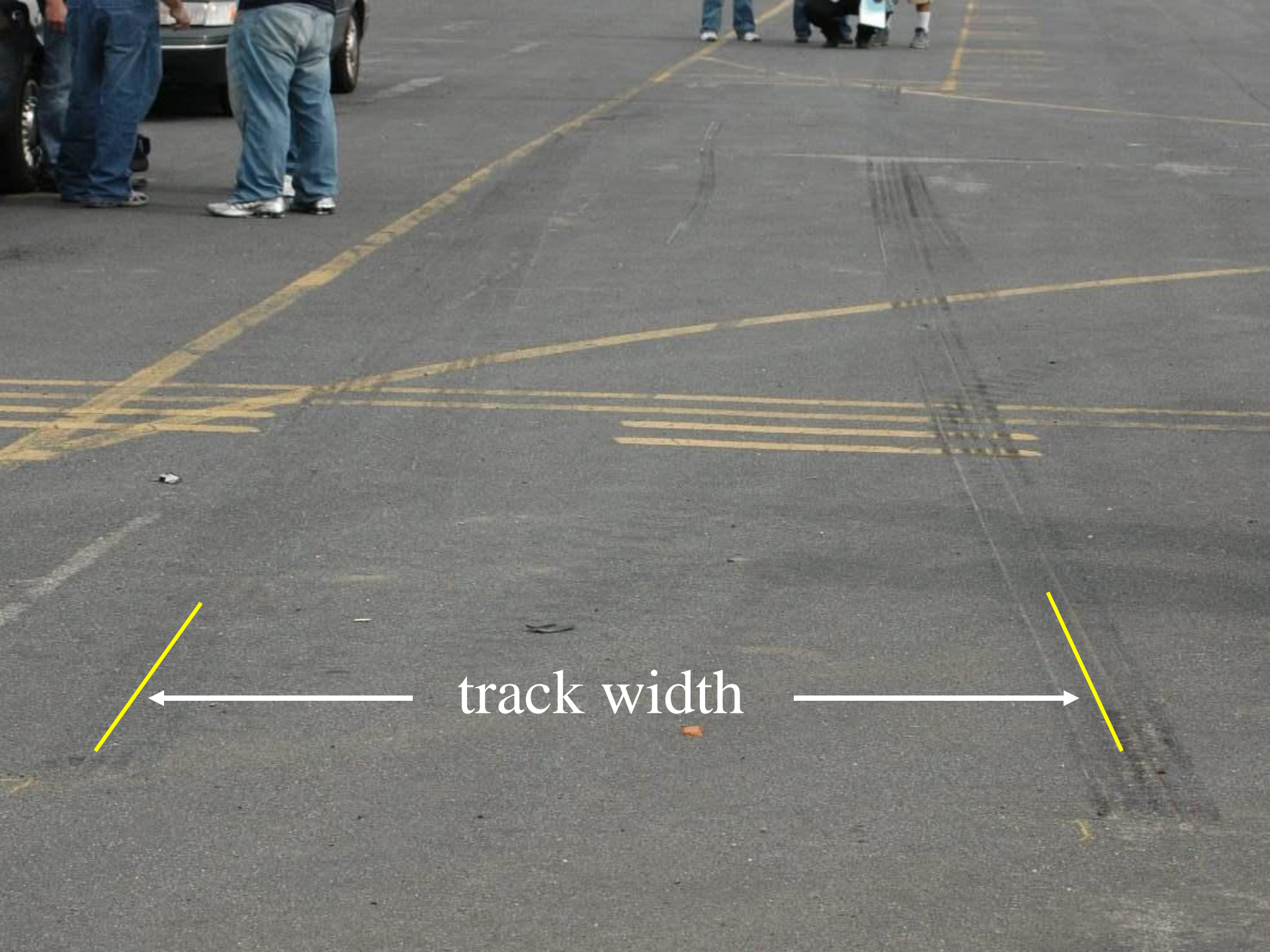
tread pattern

track width



# Track Width





track width

“mapping” the scene to  
produce a to-scale diagram.

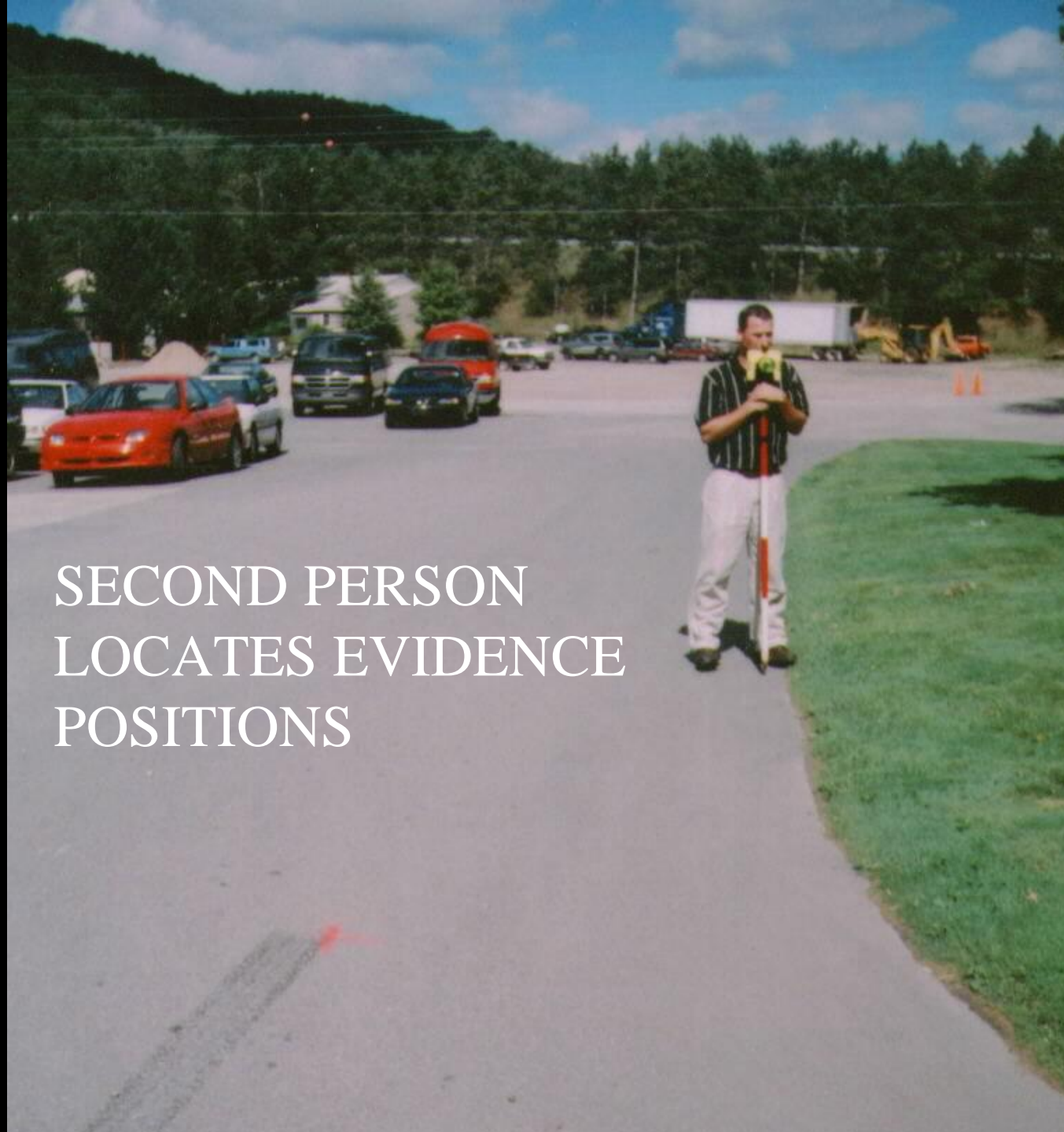


# TOTAL WORK STATION

- USES ELECTRONIC TRANSIT
- OPERATOR USES DATA POINT CODES
- DATA IS STORED



SECOND PERSON  
LOCATES EVIDENCE  
POSITIONS





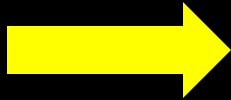


laser  
beam





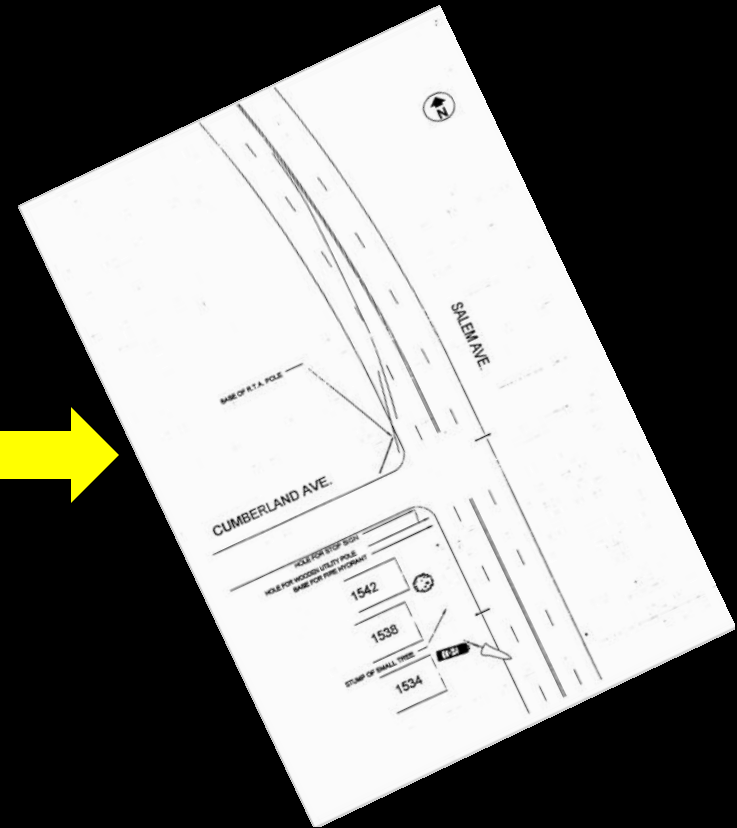
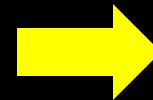
data



CAD

(computer aided drawing software)

to-scale drawing





BASE OF R.T.A. POLE

SALEM AVE.

CUMBERLAND AVE.

HOLE FOR STOP SIGN

HOLE FOR WOODEN UTILITY POLE

BASE FOR FIRE HYDRANT

1542

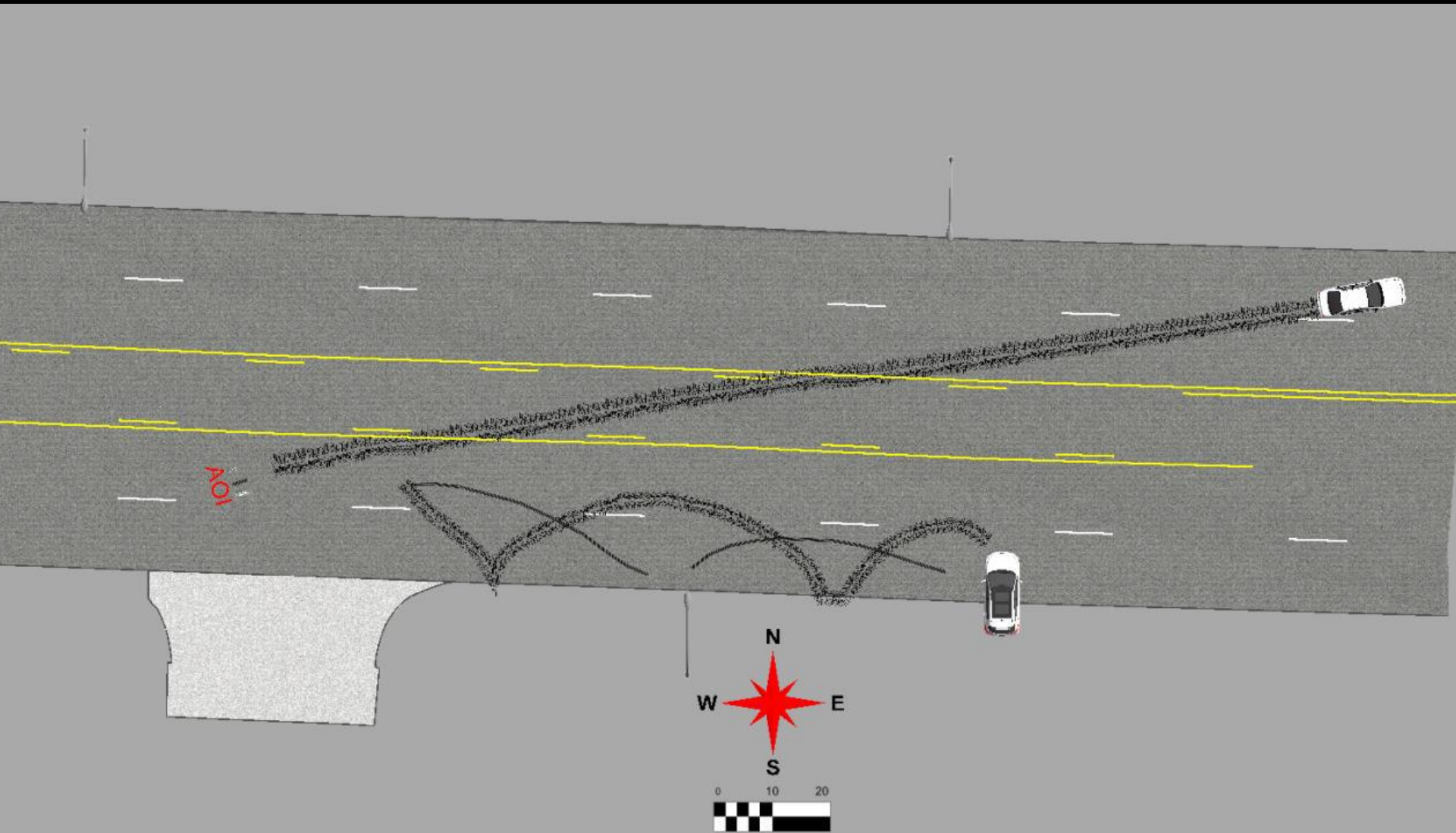
1538

STUMP OF SMALL TREE

1534

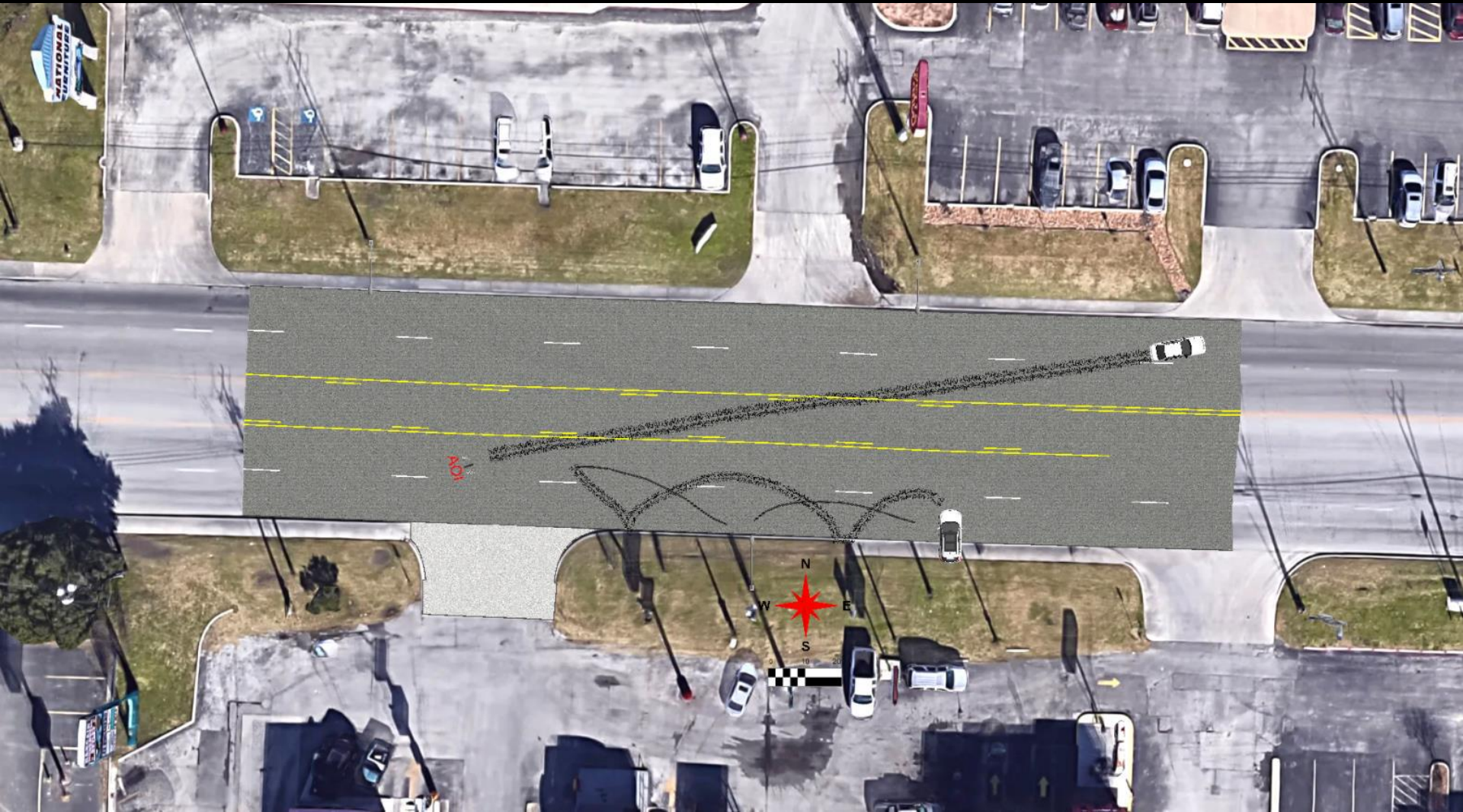


# CAD drawing





# Overlay onto a drone/Google photograph



road environment

# VISIBILITY











# MAINTENANCE





Edge drop resulted in  
double steer recovery  
maneuver, and rollover







# ENGINEERING DESIGN





# SIGNAGE, TRAFFIC CONTROL



8:30 AM next morning



Camby Road Looking Eastbound on September 13, 2009





**Camby Road Looking Eastbound on October 1, 2009**



information from  
the vehicle

# tire evidence

(before vehicle is moved)

ABS  
speckling



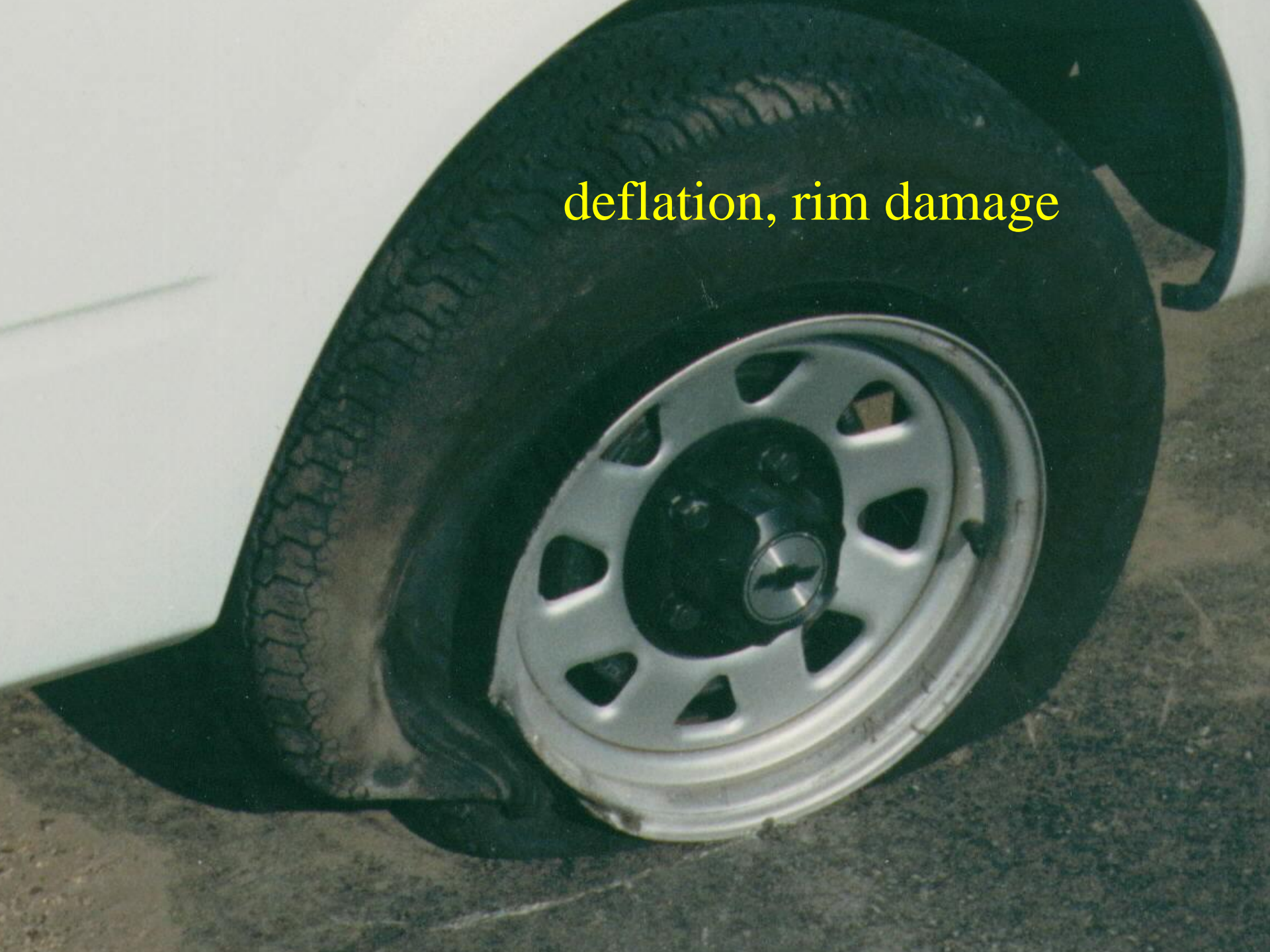


skid  
patch





deflation, rim damage

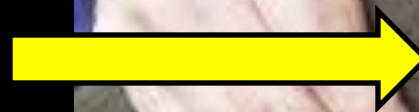




document tire  
damage  
(when did it occur?)

sudden blow out?  
(is there road evidence/)

crash damage?





document tire pressures...



and defeat a mechanical causation  
defense.

# restraint evidence

(before vehicle is moved)







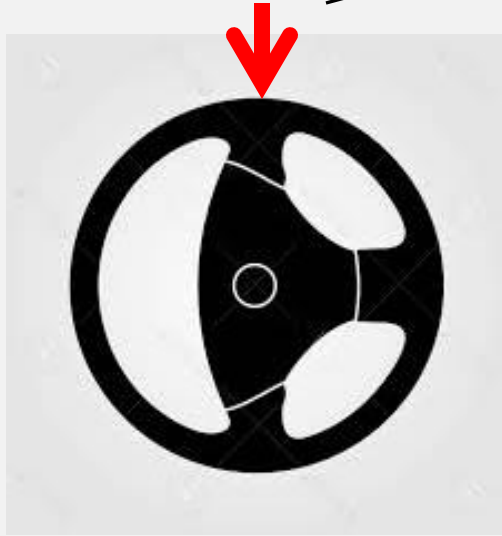
position of the wheel  
and the air bag



Steering wheel

@ FRP

evidence



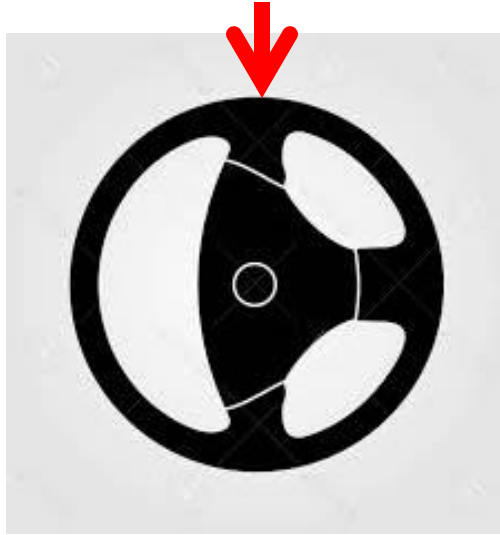
If the vehicle is lifted  
to be transported...



Steering wheel

@ FRP

evidence



The evidence  
on the air bag  
has rotated 90°



steering wheel  
on tow truck

transfer  
evidence



BLOOD SMEAR

(DNA evidence)







**FABRIC FUSION**  
(FROM JACKET)

WAS AIR BAG  
PHOTOGRAPHED  
BEFORE IT WAS  
REMOVED?







12 17'94





clothing  
transfer

# SEAT BELT STRETCH MARKS





pre-tensionor caused  
a fabric fusion mark



do you have the  
clothing?



# speedometer evidence

(before vehicle is moved)



Many vehicles have speedometers (and tachometers) that work with “stepper” motors

If power is lost in a collision the stepper motor may “lock”

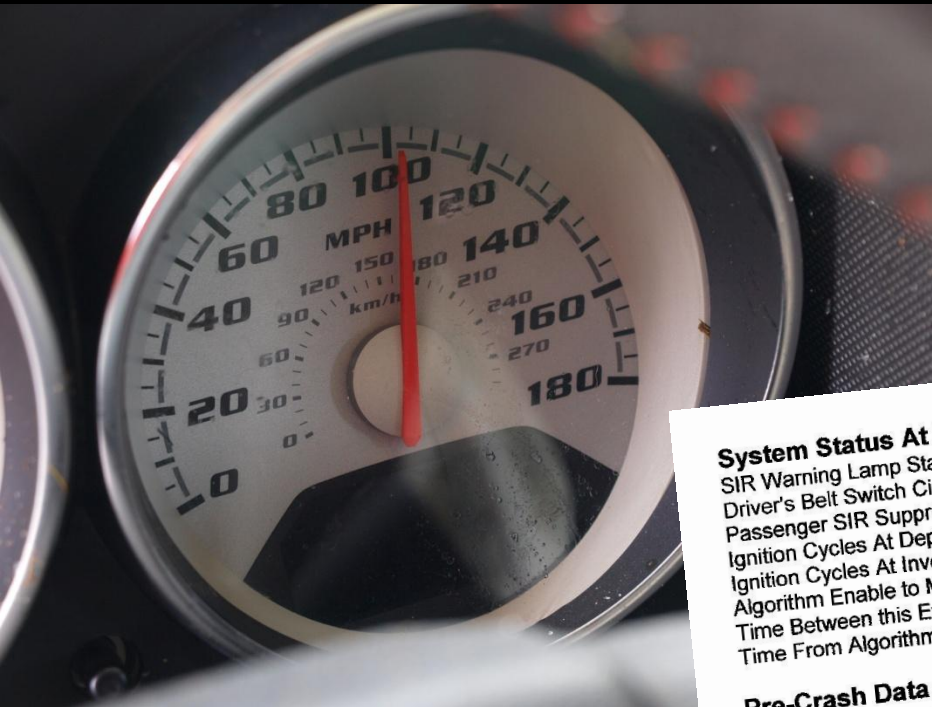
# Anthony E. Barnes (H-322)

## NC State Highway Patrol (2015)

- More than 35 examples of valid speedometer lock speeds in frontal impacts
- Corroborated by EDR download



# Speedometer ↔ EDR download



## System Status At Deployment

SIR Warning Lamp Status  
Driver's Belt Switch Circuit Status  
Passenger SIR Suppression Switch Circuit Status  
Ignition Cycles At Deployment  
Ignition Cycles At Investigation  
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)  
Time Between this Event and the Previous Event (sec)  
Time From Algorithm Enable to Deployment Command Criteria Met (msec)

OFF  
BUCKLED  
Air Bag Not Suppressed  
11087  
11088  
105  
N/A  
10

## Pre-Crash Data (Most Recent Event)

(the most recent sampled values are recorded prior to the event)

Time Stamp (sec)	Engine RPM	Speed, Vehicle Indicated (MPH)
-5.0	5,440	107
-4.0	5,696	112
-3.0	5,952	117
-2.0	6,144	121
-1.0	5,216	118
-0.1	3,680	99

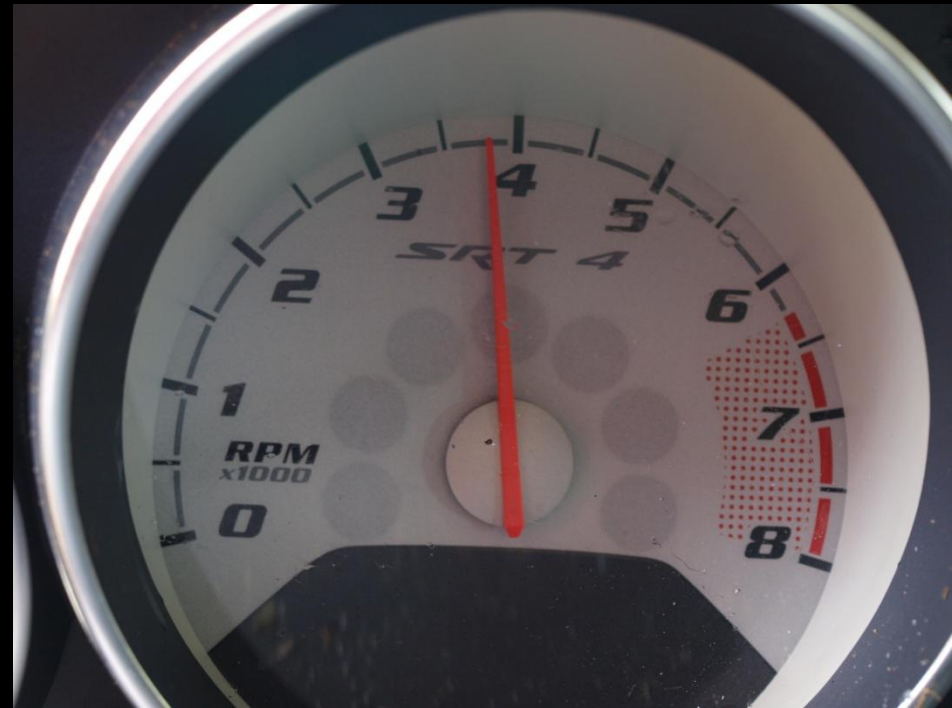
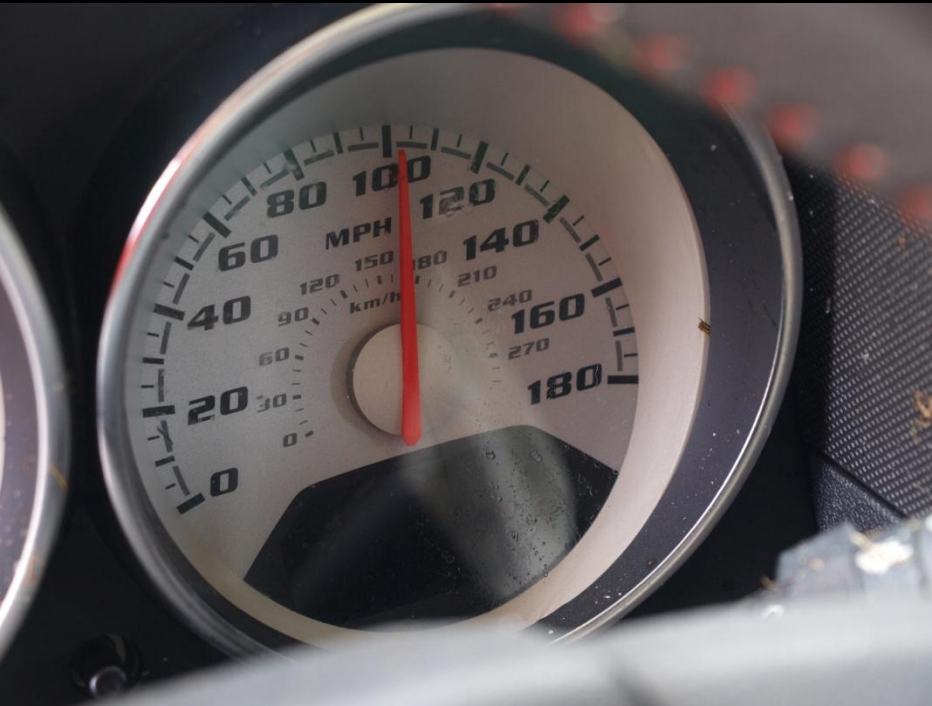
# Anthony E. Barnes (H-322)

## NC State Highway Patrol (2015)

- More than 35 examples of valid speedometer lock speeds in frontal impacts
- Corroborated by EDR download
- **Corroborated by tachometer reading**

# Speedometer $\leftrightarrow$ Tachometer

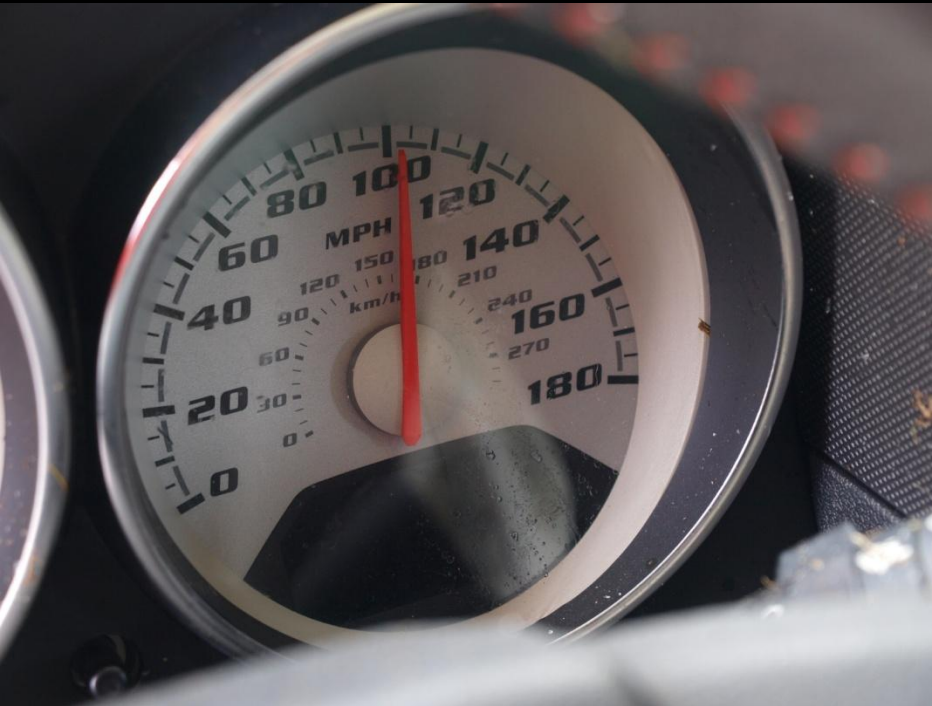
(using gear ratios,  
tire circumference)



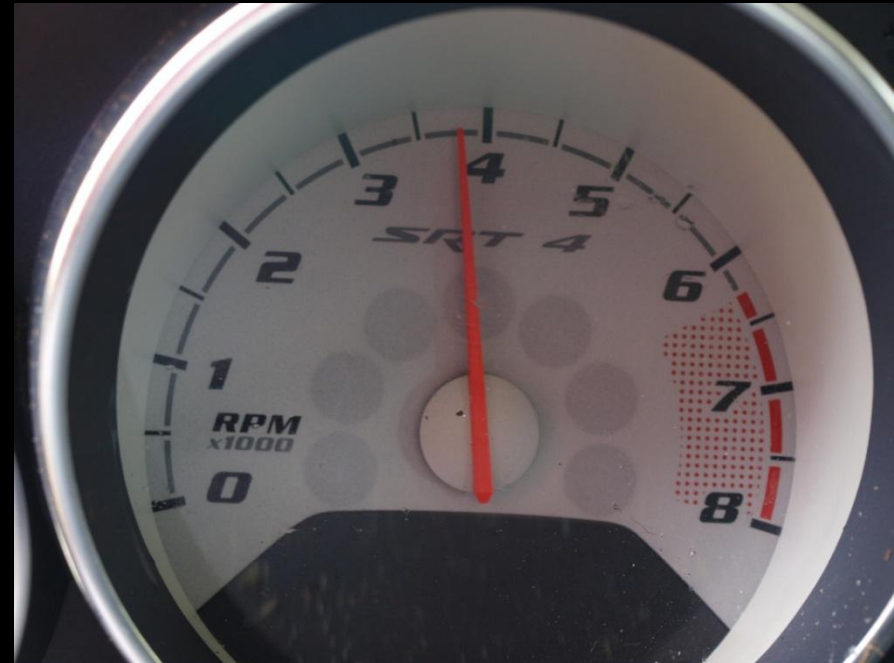


# Speedometer ↔ Tachometer

(using gear ratios,  
tire circumference)



tach verified by EDR



photograph the cluster



If you see potential evidence of  
stepper motor lockup...

*do not apply power* to the vehicle.





evidence of  
impairment



**“I ONLY HAD TWO BEERS”**



# PROOF OF IMPAIRMENT

## THE DEFENDANT



# PROOF OF IMPAIRMENT

THE DEFENDANT  
THE SCENE



# PROOF OF IMPAIRMENT

THE DEFENDANT  
THE SCENE  
THE VEHICLE





# PROOF OF IMPAIRMENT

THE DEFENDANT

THE SCENE

THE VEHICLE

DRINKING PARTNERS

BAR OR PARTY VIDEO

SERVERS, BARTENDERS  
(remember A.B.C.)

SOCIAL MEDIA

“I really f\_\_\_\_d up. I didn’t mean to do it.”

# STATE v. DAVISON

(reconstruction of BAC at time of crash)

**HIT-AND-RUN, NO BREATH/BLOOD TEST:**

WHAT WILL A TOXICOLOGIST NEED TO  
RECONSTRUCT THE BAC AT TIME OF CRASH ?

# STATE v. DAVISON

(reconstruction of BAC at time of crash)

## INVESTIGATION :

ETOH CONCENTRATION OF DRINK

TOTAL OUNCES **CONSUMED**

FOOD CONSUMED WITH DRINKING

START OF DRINKING TIME

END OF DRINKING TIME

DEFENDANT'S BODY WEIGHT, GENDER



Amount consumed by operator?

The Ugly Bear  
40 Gravelly Rd.  
Nowhere, PA 17645

Dianne

02/14/2001 18:49

1	beer	\$ 1.50
1	beer	\$ 1.50
1	beer	\$ 1.75
1	mixed drk	\$ 3.50
Subtotal		\$ 8.25
Tax:		\$ .41

---

TOTAL \$ 8.66

# BEER ALCOHOL CONTENT OF DOMESTIC AND IMPORTED BEERS

<u>Product</u>	<u>Country</u>	<u>%Ethanol by Vol.</u>
Bass Ale	UK	4.83
Boulder Porter	USA	6.07
Budweiser	USA	4.65
Busch	USA	4.72
Colt 45	USA	5.59
Coors	USA	4.55
Carona	MEX	4.84
Genesee	USA	5.03
Guinness	IRL	4.27
Haffenreffer	USA	6.62
Heineken	HOL	5.17
Kirin	JAP	6.06
Labatt's	CAN	5.34
McEwan's Scotch Ale	UK	9.51
Michelob	USA	4.8
Molson Gold	CAN	5.2
Olde English	USA	5.96
Rolling Rock	USA	4.64
Samuel Adams	USA	4.76
Schlitz Malt Liquor	USA	5.90
St. Pauli Girl	GRM	4.98

# RECONSTRUCTING THE BAC AT TIME OF CRASH

$$\text{BAC} = \text{WIDMARK} - \text{ELIMINATION} \\ ( \text{BAC}_{\text{max}} )$$



# ACTUAL FACTS OF THE CASE

DRINKING ON EMPTY STOMACH

DRINKING STARTED AT 11:00 PM

LAST DRINK AT 12:00

CRASH AT 1:00 AM

FOUR BEERS (16 OZ, 6% ETOH)

DEFENDANT WEIGHS 180 LBS

ELIMINATION RATE =  $.015 / \text{HR}$

# STATE'S EXPERT OPINION:

BAC = .132 AT TIME OF CRASH

INFORMATION NOT KNOWN  
OPENS THE DOOR FOR  
A DEFENSE HYPOTHETICAL



# HYPOTHETICAL FACTS OF THE CASE

DRINKING ON EMPTY STOMACH

DRINKING STARTED AT 10:00 PM

LAST DRINK AT 12:00

CRASH AT 1:00 AM

FOUR BEERS (12 OZ, 10 OZ CONSUMED,  
4.5% ETOH)

DEFENDANT WEIGHS 190 LBS

ELIMINATION RATE = .015 / HR

# STATE'S EXPERT OPINION:

BAC = .027 AT TIME OF CRASH

2:15 AM

Dear Mum

7:40 AM

David Brown

2:10 PM

David Brown



# Helping the jury to understand BAC

- Def's BAC was 0.27 @ 11:00 PM  
(blood test)
- ETOH elimination rate is  $-.015 / \text{hr}$   
$$0.27 \div .015/\text{hr} = 18 \text{ hr}$$

The defendant would have reached total sobriety 18 hrs later (5:00 PM the next day)

# Questions ?

[kwasnoski@aol.com](mailto:kwasnoski@aol.com)

[www.legalsciences.com](http://www.legalsciences.com)

Additional resources:

[www.legalsciences.com](http://www.legalsciences.com) - Podcasts & Radio

<https://ndaa.org/resources/publications-videos/>

free, downloadable traffic publications