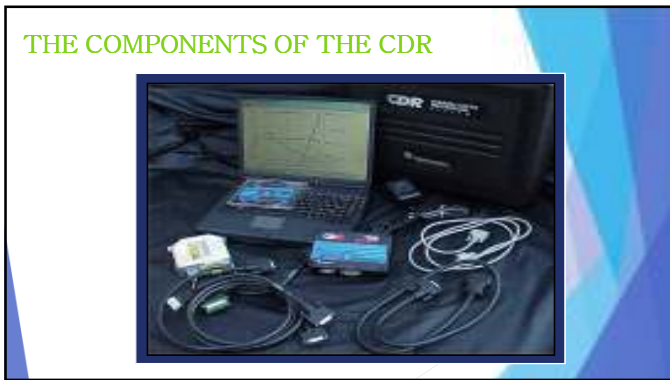


1



2



3

WHAT GETS RECORDED?

- Brake position
- Vehicle speed
- Throttle position
- Engine speed
- Total ignition cycles
- Maximum change of velocity (Delta-V)
- Seatbelt position - buckled or unbuckled

4

WHAT GETS RECORDED?

- Time of deployment command - milliseconds
- Tire air pressure
- Outside temperature
- Steering angle
- Depending upon the model, even more items may be available as to what is being recorded.

5

WHAT "WAKES UP" THE SYSTEM?

- ▶ A hard jolt to the car, such as running over railroad tracks or a crash
- ▶ The system is calculating just how "badly" events are progressing and decides to deploy the airbag so it is out and available to the occupants.
- ▶ The system must predict the need.

6

DEPLOYMENTS & NON-DEPLOYMENTS

Non-Deployment

Negative acceleration observed along the car's longitudinal (X) axis *sufficient* to cause the SDM's crash sensing algorithm to "enable", which is *insufficient* to warrant an actual deployment.

Deployment

Negative acceleration observed along the car's longitudinal (X) axis *sufficient* to cause the SDM's crash sensing algorithm to "enable" *and anticipate* a collision severity, which warrants an actual deployment for that vehicle.

7

ANTICIPATED DEPLOYMENT

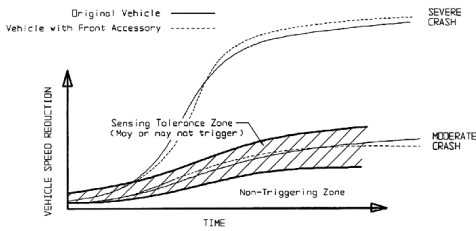


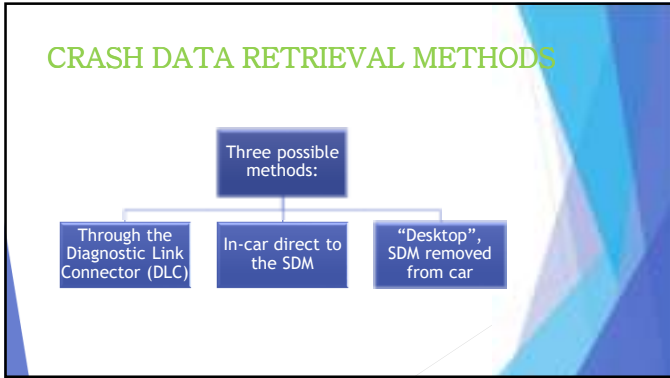
FIGURE 2—CRASH-SENSING SCENARIOS

8

DEPLOYMENT IS *NOT* DEPENDENT UPON ACTUAL DELTA-V

- ▶ Deployment is *anticipatory or predictive*.
- ▶ It is *NOT reactive*.
- ▶ System evaluates a "developing pulse" and deploys *early enough to be effective*.

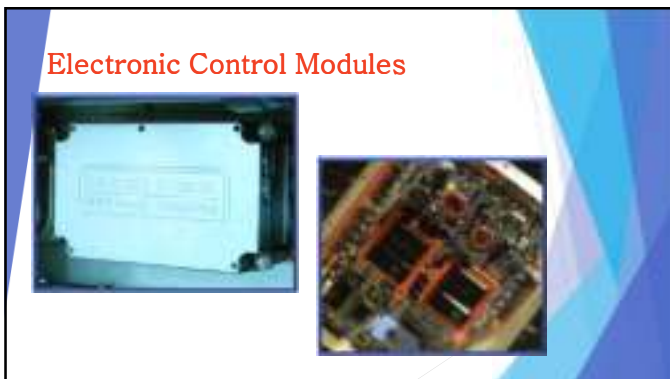
9



10



11



12

DOES ONE SIZE FIT ALL?

- ▶ Each ECM is manufactured for the specific engine.
- ▶ In 1995, the engine manufacturers made available more recording capability for the ECMs.
- ▶ Because each engine ECM (Detroit, Cat, Cummins, Mack, Mercedes) is different, it requires separate software and equipment to access the data.



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What Is Contained In The ECM?

Just as the equipment and software to download each ECM is different, so is the information contained in each module.

Typical information contained in the ECM:

- 1. Audit trail
- 2. Configuration and calibration settings
- 3. Event and incident data
- 4. Diagnostic information
- 5. Maintenance information
- 6. Trip information
- 7. Last stop record

14

EVENT AND INCIDENT DATA

- ▶ Sudden deceleration (hard brake, quick stop, panic stop, etc). The time generally recorded is 60 to 90 seconds. Example: 45 seconds prior to incident and 15 seconds after incident.
- ▶ Vehicle speed, engine speed, brake, clutch, engine load, throttle, cruise (on/off), and diagnostic codes typical in record. Typical setting is 7mph/sec/sec car

THIS ASSUMES THE ECM IS SET TO RECORD THIS INFORMATION!!!
THERE IS NO WAY TO KNOW WITHOUT A DOWNLOAD.

15

DIAGNOSTIC INFORMATION

- ▶ This is what the name implies, the ECM senses that something is wrong with the engine and records a "Fault Code".
- ▶ There are numerous monitored systems.
Examples are: electrical, oil pressure, coolant level or pressure, etc.
- ▶ Some are logged and stored and some are listed as active and warn the driver.

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TRIP INFORMATION

- ▶ This is generally defined as the time between resets.
- ▶ Typical information in trip report:
 - ❖ *Total distance*
 - ❖ *Average speed*
 - ❖ *Idle time, run time. This can be recorded by date and time to compare to driver's daily log.*
 - ❖ *Cruise time*
 - ❖ *Miles per gallon*
 - ❖ *Highest engine speed and vehicle speed*

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LAST STOP RECORD

- ▶ This record is created when the vehicle speed is less than 1.5 mph for two seconds, or the ignition is turned off and remains stopped for 15 seconds.
- ▶ This record contains operating data for 45 seconds before and 15 seconds after the trigger point.
- ▶ The data is similar to the "Hard Brake".
- ▶ There is only 1 "Last Stop Record" and it is constantly overwritten.

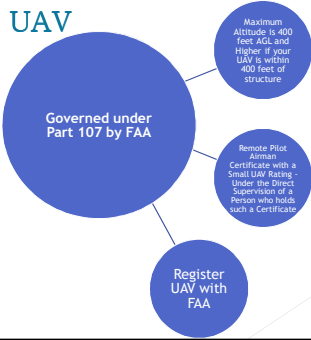
18

UAV's in Accident Reconstruction



19

What is a UAV



20

Types of UAV's

Basically Two General Types

Cheap ones	<ul style="list-style-type: none"> • Short Duration Flights with photos/videos • These are not useful in Accident Reconstruction
Expensive Ones	<ul style="list-style-type: none"> • Fixed Wing and Quadcopter • These are Flying Surveying Instruments • Positions are fixed by GPS Coordinates

21

Ground Based GPS Measuring

Used to Verify Accuracy of UAV Measurements and small items of Evidence not providing sufficient contrast.



22

Flight Procedures

Is it Safe to Fly?

- Airports
- Crowds in the open
- Structures
- Power Lines
- Winds Aloft
- VFR
- UAV in View at all times



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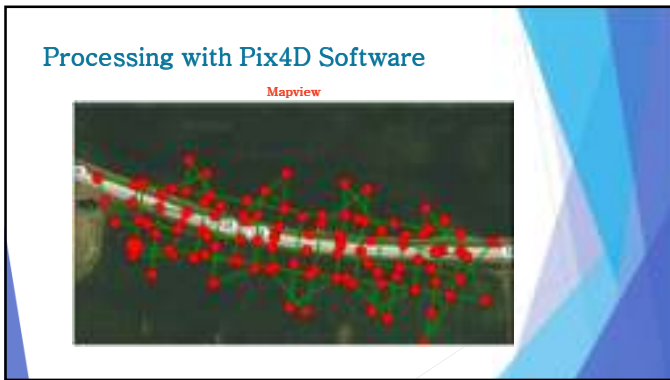
Emotion2 Software In Flight



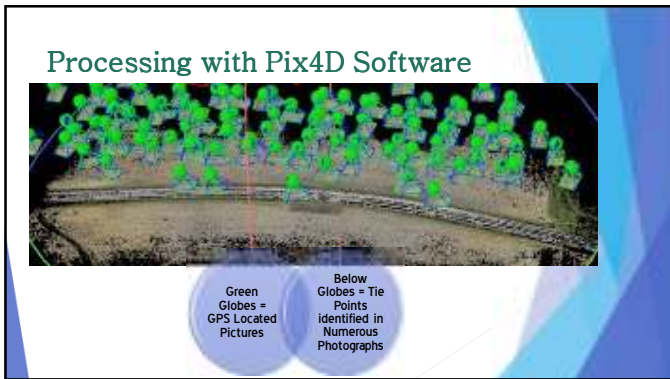
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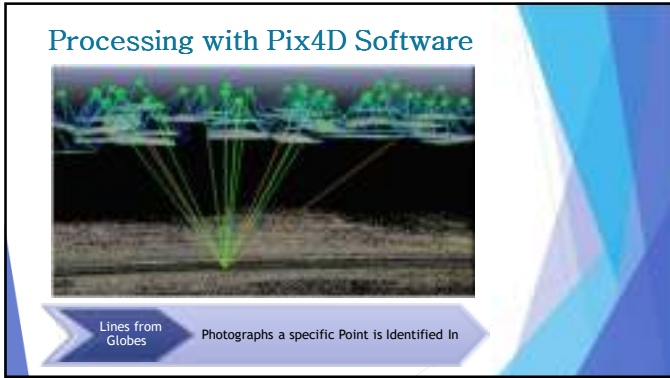
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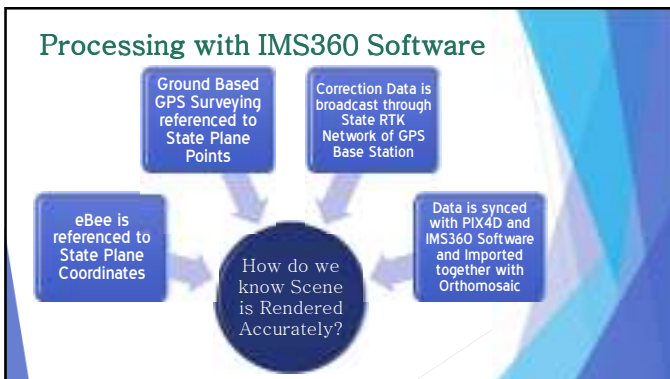
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Processing with IMS360 Software



Skid Marks
Paint Marks

Notice No Vehicles in the High Definition Photo. The Software has the Capability of Removing (Not Deleting) Moving Vehicles. Photos are Realigned and Evidence is Visible that Once was under a Moving Vehicle.

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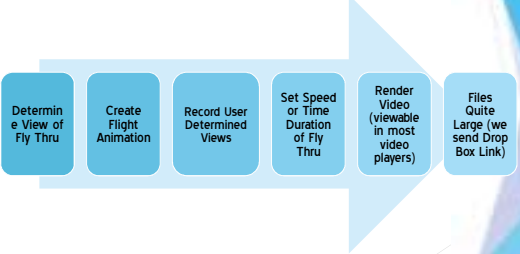
Processing with IMS360 Software



Ground Based Unit with Several Measurements to Verify Accuracy. Each "X" represents a measured point or the Rod Location. The Measurement Differences Between the Ground Base GPS and eBee is so close as to be Meaningless...

32

PIX4D Fly Thru Creation



```

    graph LR
      A[Determine View of Fly Thru] --> B[Create Flight Animation]
      B --> C[Record User Determined Views]
      C --> D[Set Speed or Time Duration of Fly Thru]
      D --> E[Render Video (viewable in most video players)]
      E --> F[Files Quite Large (we send Drop Box Link)]
  
```

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Benefits of UAV Scene Documentation

Highly Accurate

Verifiable

Evidence is Visible in HD Photographs

Tire Marks, Impact Gouges, ETC. are Visible to Jury

Reconstructionist can Point out Items of Interest to Juries

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Benefits of UAV Scene Documentation

- Real Time Overhead View
- Not a Google Earth Image
- Scenes Documented Faster than Scanning
- Scanning is Only Line of Sight
- UAV's Allow Documentation of Busy Roads and Overpasses.
- Location is Verified based on GPS Coordinates

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Questions or Comments?

- ▶ Presented By: Stan Oglesby, ACTAR #62
- ▶ Midwest Accident Reconstruction Services, LC
- ▶ 110 South Main Street, P.O. Box 101
- ▶ Concordia, Missouri 64020
- ▶ Telephone: 660-463-7006
- ▶ Mobile: 660-287-1781 (Answered 24/7)
- ▶ www.accidentinvestigation.com

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