WESLEY VANDIVER, ACTAR

• 30 Years of Collision Reconstruction and Vehicle Forensics Experience
  — Collision Forensics, Inc., President
  — Berla Corporation, Director of Training
  — Collision and Injury Dynamics, Senior Consultant
  — Orange County District Attorney’s Office, Vehicular Homicide Unit
  — California Highway Patrol (MAIT)
• Certifications
  — Accredited Traffic Accident Reconstructionist, ACTAR
  — Crash Data Retrieval Technician, Analyst & Trainer 
  — Vehicle System Forensics Certifications, Berla Corporation
• Expert Witness in Collision Reconstruction, Vehicle Forensics, and EDRs
  — California Superior Courts
  — United States District Court
  — District Court of South Australia

• Instructor Experience
  — Northwestern University – Adjunct Faculty
  — University of North Florida, IPTM – Adjunct Faculty
  — Berla Corporation – Forensic Analyst and Instructor
  — Riverside Community College – Adjunct Faculty
• Vehicular Homicide Investigations
  — 5,000+ Collisions Investigated
  — 550+ Vehicular Homicide Convictions
  — 35 Vehicular Murder Convictions
• Professional Publications
  — SAE 2018-01-1442 - Accuracy of Speed Data Acquired from Ford Sync Generation 2 and Generation 3 Modules Utilizing the Berla iVe System
  — Road & Track Magazine - March/April 2015, Featured in Crash Test Human
  — CDAA Prosecutor’s Brief - Spring 2015, Event Data Recorders in Collision Analysis for Prosecution
  — SAE 2015-01-1445 - Analysis of Crash Data from a 2012 Kia Soul Event Data Recorder
  — Collision Magazine - Spring 2013, Investigation of Vehicular Murder
  — SAE 2013-01-1263 - Validation of Mitsubishi Lancer EDRs
INFOTAINMENT & TELEMATICS
OVERVIEW – BERLA IVE SYSTEM

VEHICLE SYSTEM FORENSICS IN CRASH RECONSTRUCTION

DATA INTRODUCTION
INFOTAINMENT

- The combination of information and entertainment
- Connects the occupants to their digital world
- Provides information on vehicle performance, scheduled maintenance, and current status
- Generally interacts directly with occupants and is main focal point

TELEMATICS

- The integration of telecommunications and information
- Basically wireless connectivity, usually Vehicle to Infrastructure (V2I) or Vehicle to Vehicle (V2V)
- Facilitates requests to/from infotainment system
INFORMATION

- **Connected Devices**: Identify devices that have been connected to a vehicle via Wi-Fi, Bluetooth and/or USB, and all of the data associated with those devices.
- **Location Data**: Recover location data and navigation information such as tracklogs, saved locations, active routes and previous destinations.
- **Vehicle Events**: See events associated with a vehicle such as doors opening/closing, lights turning on/off, locations and timestamps.

BLUETOOTH CONNECTIONS

- BT MAC addresses
- Connection times
- Device phone number
- Phone type
- Phone OS
DEVICE CALL LOGS

- Multiple versions of the call logs are kept from a phone
- Includes incoming, outgoing and missed
- Call times normally come from the mobile phone

DEVICE CONTACTS

- Multiple versions of the contact list are kept from a phone
- Full contact information downloaded
- Including contact card photos

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Wesley Vandiver, ACTAR
DEVICE SMS

- Mostly incoming SMS while the phone is connected
- Sometimes outgoing SMS will be present
- Sometimes all SMS will be downloaded to the car

NAVIGATION LOCATIONS

- Locations saved by the user - normally ‘Home’ and ‘Office’
- Previous destination entered by the user
**TRACKLOGS**

- Breadcrumb trail of everywhere the vehicle has been
- Recorded at one-second intervals

**VEHICLE EVENTS**

- System log files that are recording different events taking place throughout the vehicle
- Examples: doors activity, gear shifts, hard braking, wheel slip, odometer readings, phone calls, system reboots
• Event type: doors
• Shows the time and location of which door was opened or closed

• Event type: gear shifts
• Shows which gear the user shifted the transmission into, along with time and location
VEHICLE EVENTS

• Event type: wheel speeds
• Records the time and approximate location of wheel speed measurements
• Usually records 10 per second
VEHICLE EVENTS

- Event type: hard acceleration
- Shows the time and location of hard acceleration events
VEHICLE EVENTS

- Event type: hard braking
- Shows the time and location of hard braking events
VEHICLE EVENTS

- Event type: odometer reading
- Shows the time and location for when and where the odometer reading was recorded

FORD SG2 AND SG3 VEHICLE SPEED VALIDATION

VEHICLE SYSTEM FORENSICS IN CRASH RECONSTRUCTION
VEHICLE SPEED VALIDATION

2013 Ford Focus
Ford Sync Generation 2 (SG2)

2016 Ford Explorer
Ford Sync Generation 2 (SG2)
VEHICLE SPEED VALIDATION

2017 Ford Edge
Ford Sync Generation 3 (SG3)

VEHICLE SPEED VALIDATION

2017 Ford Expedition
Ford Sync Generation 3 (SG3)
TEST 2 – SYNC GEN 2

![Map Diagram]

**Ford Focus Sync Gen2**

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
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<tr>
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<td>50</td>
<td>50</td>
</tr>
<tr>
<td>80</td>
<td>80</td>
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</table>

**R = 0.997**

**RMSE = 1.00**
TEST 3 – SYNC GEN 2

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TEST 4 – SYNC GEN 2
TEST 5 – SYNC GEN 3

![Map of the test area]

TEST 5 – SYNC GEN 3

![Graph showing vehicle speed over time]

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TEST 6 – SYNC GEN 3

![Map Image]

TEST 6 – SYNC GEN 3

![Graph Image]

R = 0.999 & 0.990
RMSE = 1.26 & 1.32
TESTS 7 & 8 – SYNC GEN 3

TEST 7 & 8 – SYNC GEN 3
TEST 7 – SYNC GEN 3

Ford Expedition Sync Gen3

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TEST 8 – SYNC GEN 3

![Diagram of TEST 8 – SYNC GEN 3](image)

TEST 8 – SYNC GEN 3

![Graph of Ford Expedition Sync Gen3](image)
WHAT’S NEW IN TRAINING...

VEHICLE SYSTEM FORENSICS IN CRASH RECONSTRUCTION

CERTIFICATION PROGRAM

CERTIFICATE OF COMPLETION
Vehicle System Forensics Course

Name: Wesley Vandiver

CERTIFICATE OF COMPLETION
Vehicle System Forensics Technician

Name: Wesley Vandiver

CERTIFICATE OF COMPLETION
Vehicle System Forensics Examiner

Name: Wesley Vandiver
CONCLUSIONS

Vehicle infotainment and telematics data can be valuable evidence in many types of investigations.

Under certain circumstances, infotainment and telematics data may be the only electronic data available from a vehicle.

Instrumented testing has shown the recorded speeds from Ford SG2 and SG3 systems to be as accurate as any other recording device.

Although often overlooked in the crash reconstruction industry, the user data within a system can be valuable evidence in cases such as hit-and-run, insurance fraud, using the phone or texting while driving, etc.

Multiple makes have systems that are now supported for the acquisition of track logs and velocity logs.
QUESTIONS

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