C.A.R.S.
COLLISION ANALYSIS & RECONSTRUCTION SQUAD

Sgt Patrick Sweeney
TFC Donald Comstock
TFC. Mark DiCocco
TFC Albert Gorski
TFC Mark Pereira
TFC Gregory Trahan
TPR Brindiana Warenda
TFC John Wilson
C.A.R.S.  
COLLISION ANALYSIS & RECONSTRUCTION SQUAD

SUBJECTS COVERED TODAY

Introduction to our unit and its members

How C.A.R.S. is used within the State Police

How our mapping equipment works

An introduction to information obtain from Event Data Recorders (EDR)
As a full time unit, C.A.R.S. personnel operate under the command of the Traffic Services Unit. Functioning in a team concept, C.A.R.S. serves as an additional specialized resource to assist Troop Commands, local departments, or the State’s Attorney’s Office.
Mission Statement

Our mission is to conduct thorough, comprehensive investigations of serious injury, fatal and complex motor vehicle collisions. The primary objective is to determine as accurately as possible how a collision occurred utilizing the physical evidence and facts available from the scene and when necessary provide expert court testimony. Through the application of the laws of physics, latest forensic mapping, current motor vehicle crash instruction and theories as well as new or updated Connecticut General Statutes this mission will be fulfilled.
C.A.R.S.
COLLISION ANALYSIS & RECONSTRUCTION SQUAD

REQUESTS FOR C.A.R.S

During business hours:
• Commanding Officer shall be notified directly

During off hours:
• Contact shall be made through the Communications Center at Headquarters

Direct 860-685-8666  Communication Center 860-685-8190
Criteria For Mandatory C.A.R.S. Response

1. Any department vehicle collision that involves serious injury or fatality.
2. Any serious injury/fatal crash that arises from a department pursuit.
3. Any serious injury/fatal crash with a strong probability of serious criminal charges being filed.
4. Any crash with multiple fatalities.
5. Any serious injury/fatal crash at a work zone under the control of the Connecticut Department of Transportation.
6. There may be other circumstances that would render the response of C.A.R.S. personnel. C.A.R.S. personnel may be requested for any collision situation that a District of Troop Commander deems appropriate.
Calls to assist the Major Crime Unit consist of forensically mapping large or complex scenes including:

- Police involved shootings
- Homicides
- Home invasions
- Suspicious incidents
C.A.R.S. unit members have received specialized training in several different types of accident investigation including:

- Accident Reconstruction
- Pedestrian/Bicycle
- Motorcycle
- Commercial Vehicle
- Crash Data Retrieval
C.A.R.S.
COLLISION ANALYSIS & RECONSTRUCTION SQUAD

At Scene Investigative Steps

- Survey entire scene / roadway looking for physical evidence (Pre-impact, impact, post impact, roadway issues).
- Photograph scene with Digital camera -roadway & vehicles.
- Mark roadway evidence and vehicles.
- Set up Total Station/GNSS mapping instrument.
- Prepare detailed diagram of scene.
- Conduct post collision vehicle inspections.
- Prepare detailed supplemental report containing our analysis of the cause of the collision.
- We do NOT do entire fatal investigative report, we only do a supplemental report for investigating Trooper.
Laser Mapping System

- The total station or a laser mapping system is probably the most universal tool working at crash and crime scenes.
- This is due to this technology’s portability, accuracy, fast operation, and low cost compared to other mapping technologies.
- A total station is a multi-purpose electronic instrument used for years
Laser Mapping System

- Using a built-in electronic distance measuring instrument (EDMI), a total station measures horizontal distances, slope distances, angles, vertical height differences, and three-dimensional coordinates.

- Measurements are mapped with an onboard or portable data collector that is usually linked to data-recording software.
Laser Technology Inc. (LTI) Mapping System
LTI Mapping System Components

- Laser
- Angle Encoder
- Data Collector
- Tri-brach
- Tripod
- Prism Pole(s)
LTI Mapping System
Measurement Accuracy

- Distance Accuracy = +/- 4 cm or 1.5 inches
- Angle Accuracy = +/- 0.1 degrees
- Maximum Range = 1900 Feet.
Work Team Flow

- The work is normally performed by at least two people:
  - **The Instrument Operator** is responsible for setting up and operating the laser and data collector.
  - **The Prism Operator** is responsible for identifying and properly coding the objects to be located and communicating that data to the instrument operator.
Advantages of GNSS vs. Laser Mapping

- Accuracy
- No Sightline Obstructions
- Greater Range (unlimited)
- Can Be Used By One Person
- Quicker Scene Clearance
GNSS Receiver

- "Measures" using radio signals from satellites
- Clear path from receiver to satellites
- Information is collected from at least 5 satellites.
- The information provided by the GNSS is the result of numerous calculations.
Data Collector

- Carlson MINI 2
- Carlson SurvCE mapping software
GNSS Accuracy

- Horizontal Distance is measured to +/- 1 cm.
- Vertical Distance is measured to +/- 2 cm.
- Minimum 10 Satellites.
- Max Range: Unlimited.
Care & Maintenance

- Operating Temperature: -40 F to 158 F.
- Moisture and Dust Protection.
- Shock Protection (6.5 FT).
- Cost = Approximately $17,000
Laser or GNSS instrument?
After scene measuring

- Data Collector is connected to a personal computer
- Scene data is downloaded to a personal computer using Active Sync software
- Annotations, modifications and printing are completed using computer aided drawing software
Prepared Diagram
Crash Scene

- Five vehicle Fatal Collision Rte #2
  Marlborough CT October 2007
C.A.R.S.
COLLISION ANALYSIS & RECONSTRUCTION SQUAD
REDUCE SPEED TO 45 M.P.H.

LEFT LANE CLOSED AHEAD

TIRE MARK KEY

VEHICLE #1 "BLACK"

VEHICLE #2 "DARK BLUE"

VEHICLE #3 "BRIGHT BLUE"

VEHICLE #4 "PINK"

ROADWAY EVIDENCE

SCRATCHES "RED"

GOUGES "GREEN"

CONNECTI CUT DEPARTMENT OF PUBLIC SAFETY

DI VISION OF STATE POLICE

COLLI SI ON ANALYSIS & RECONSTRUCTI ON SQUAD

CASE #: 0700425148

MARLBOROUGH CT

RTE # 2

DRAW I NG PREPARED BY TFC JOHN GUARI # 399

DATA COLLECTED ON 10-15-2007

TIRE MARK KEY

VEHICLE #1 "BLACK"

VEHICLE #2 "DARK BLUE"

VEHICLE #3 "BRIGHT BLUE"

VEHICLE #4 "PINK"

ROADWAY EVIDENCE

SCRATCHES "RED"

GOUGES "GREEN"
C.A.R.S.
COLLISION ANALYSIS & RECONSTRUCTION SQUAD
Event Data Recorder
EDR
Event Data Recorders are powerful objective witnesses that can give important information with regards to pre-impact movement of the involved vehicle(s).

Event Data Recorders are recording more useful information in recent model vehicles and continue to grow in capability.

Only approximately 25% of the vehicles on the road currently can be read with publicly available tools. To read modules not publicly supported, the investigator may need to contact the manufacturer to get assistance.
The Event Data Recorder is just one more tool to improve the accuracy of a crash reconstruction.
C.A.R.S.
COLLISION ANALYSIS & RECONSTRUCTION SQUAD

Event Data Recorders
EDR

- ACM Airbag Control Module
- SDM Sensing Diagnostic Module (GM) 1994
- RCM Restraint Control Module (Ford) 2001
- ORC Occupant Restraint Controller (Chrysler) 2004

DO NOT refer to as a “BLACK BOX”
Sec. 14-164aa

(1) “Event Data Recorder” means a device or function in a passenger motor vehicle that records the vehicle’s dynamic, time-series data during the time period just prior to a crash event, including, but not limited to, vehicle speed versus time data, or during a crash event, including, but not limited to, delta-V versus time data, intended for retrieval after the crash event;

(2) “event data” does not include audio or video data..

(b)(1) Except as provided in subsection (c), no person, except the registered owner of the motor vehicle that contains the event data recorder, or the registered owner’s representative, may retrieve, obtain or use data stored on or transmitted from the event data recorder unless;
(A) The individual who is the registered owner or lessee or representative, consents in writing;

(B) The data is retrieved or obtained by a peace officer pursuant to a search warrant issued by a judge of the Superior Court or a trial judge referee, or by any court of competent jurisdiction.

(E) The data is retrieved or obtained pursuant to a legally proper discovery request or order in a civil action.

At no time does the statute refer to this as a “black box”
Comparison often made to a FLIGHT DATA RECORDER.

The “BLACK BOX”
EDR and FDR

**Airbag Control Module**

Primary purpose is to check a vehicle safety system THEN deploy airbags and/or seatbelt pretensioners when appropriate.

Secondary function is to record data including crash data.

**Flight Data Recorder**

Primary purpose is to record in-flight data, crash data, cockpit voice recordings.

**CONTROLS SAFETY FUNCTIONS**

**NO CONTROL FUNCTIONS**
C.A.R.S.
COLLISION ANALYSIS & RECONSTRUCTION SQUAD

Uses of Data

Safety: Improve on vehicle design and highway infrastructure

Government: Provide a basis for regulatory and consumer information initiatives.

Crash Reconstructionist: Provide actual data for analytical evaluation and validation of mathematical techniques.

Influence driver behavior!!
WHAT GETS RECORDED?

Different make and model vehicles record different amounts of information or events.

An event is a condition where the EDR has recognized some type of sudden slowing of the vehicle front-to-rear.

These can come from impacts or hard braking.
WHAT GETS RECORDED?

Crash severity expressed in DELTA V in MPH

Pre crash vehicle Speed/Brake/Throttle/RPM

Driver & front seat passenger Seat Belt Use

In some newer models, many other parameters including Rollover, Side and rear impact data and Steering Wheel information.
2. Whether the Fourth Amendment to the US Constitution in any way bars the collection of the data recorded by the EDR.

It would appear that police (or other government accident investigators) may properly seize such devices (or otherwise collect the data there from) without a warrant during a post-accident investigation. This authority is premised upon two legal issues:

1. Because seizure of a required safety device does not constitute a search implicating the Fourth Amendment.
2. Seizure of a safety device qualifies under the exemption for conducting a warrantless search.

However, we in Connecticut have 14-164aa superseding this notion.
Remember,

This is not stand alone data and should always be accompanied with a properly conducted crash analysis.
C.A.R.S. investigational findings if applicable will always include speed calculations for the offending vehicle. A critical speed yaw analysis is a “TRUE” speed for the involve vehicle.
In an effort for quick clearance, C.A.R.S. has requested bids for complete Unmanned Aerial System (UAS) to achieve timely clearance of accident scenes. Drones can significantly reduce the on-scene time for C.A.R.S.
C.A.R.S.
COLLISION ANALYSIS & RECONSTRUCTION SQUAD

Drone Technology in Crash Reconstruction
In conclusion C.A.R.S. makes every effort to clear a road closure as quickly as possible. It is our primary concern to locate all of the evidence on the roadway to identify the collision sequence and often we only have that moment to reconstruct the scene.
C.A.R.S.
COLLISION ANALYSIS & RECONSTRUCTION SQUAD

THANK YOU!!