

David Hasselhoff No Longer Owns the Only Talking Car: Automotive Black Boxes in Criminal Law¹

“Ladies and gentlemen of the jury, the testimony will show that the defendant was driving not only at speeds in excess of eighty miles per hour, but also without a seatbelt buckled and without depressing a brake until after his airbag had already deployed. You will see his wanton and reckless conduct through the incontrovertible facts recorded, in the last seconds before the crash, by the most impartial witness conceivable—his very own car.”²

I. INTRODUCTION

Computer systems that record data about automobile functioning have been inseparable components of many airbag systems since the early 1970s.³ With the full support of government agencies, the promise and utility of these “black boxes” initially lay in acquiring a more accurate picture of seatbelt use, airbag functioning, and highway safety at-large.⁴ Later, increased ability of

1. David Hasselhoff starred in the 1982-86 television series *Knight Rider* as vigilante crime-fighter Michael Knight, who drove a talking car named K.I.T.T. (Knight Industries Two Thousand). *Knight Rider*, in Internet Movie Database (detailing television program *Knight Rider*), at <http://www.imdb.com/title/tt0083437> (last visited May 29, 2005).

2. See *People v. Christmann*, 776 N.Y.S.2d 437, 439 (N.Y. J. Ct. 2004) (noting Sensing Diagnostic Module records speed, brake data, change in velocity, seat belt use). This is the next step in courtroom use of what one commentator has described as “a voiceless ‘witness’ stashed underneath your car’s dashboard that is about the size of a carton of cigarettes.” David Uris, Comment, *Big Brother and a Little Black Box: The Effect of Scientific Evidence on Privacy Rights*, 42 SANTA CLARA L. REV. 995, 996 (2002). Uris described a nightmare hypothetical involving use of event data recorders (EDRs) to produce a finding of civil liability with only one witness—the defendant’s black box. *Id.* at 995-96.

3. David M. Katz, Note, *Privacy in the Private Sector: Use of the Automotive Industry’s “Event Data Recorder” and Cable Industry’s “Interactive Television” in Collecting Personal Data*, 29 RUTGERS COMPUTER & TECH. L.J. 163, 169-70 (2003) (noting General Motors’ airbag-equipped cars have recorded airbag status and crash severity data since 1974). *But see* Dennis Donnelly, *Black Box Technology in the Courtroom*, 38-APR TRIAL 41, 41 (2002) (noting in 1974 government tested full recorders not inherent to airbags in only twenty-six low-speed crashes). Although preliminary testing began in the 1970s, full recorders did not become commonplace until the early 1990s. *Id.*

4. ECON. & SCI. PLANNING, INC., OFFICE OF TECH. ASSESSMENT, HOUSE COMM. ON APPROPRIATIONS, AUTOMOBILE COLLISION DATA: AN ASSESSMENT OF NEEDS AND METHODS OF ACQUISITION ii (Feb. 17, 1975) (urging, circa 1974, data collection to avert \$22 billion annual automobile death, injury, and damage), available at http://www-nrd.nhtsa.dot.gov/edr-site/uploads/Automobile_Collision_Data—An_Assessment1.pdf. The report also recommended use of data in improving motor vehicle safety standards and suggested “secondary benefits” including determination of driver errors and measurement of driver training effectiveness. *Id.* The report foreshadowed EDR inclusion as evidence in civil litigation by mentioning a “possibility that [recorder data] could be used in liability cases.” *Id.* The report also identified such other potential uses as determining

automobile manufacturers to read the data from black boxes transformed a triggering mechanism for airbags into a powerful weapon used by manufacturers to defeat product liability claims by customers who blamed driving accidents on their cars.⁵ Courts slowly began to piece together jurisprudence on the admissibility and probative value of black box data in civil litigation, using a variety of federal and state evidentiary standards for expert testimony.⁶ In 2000, however, a private company began to retail a device that allows anyone with a laptop computer running the Windows operating system to plug into the black box and download all of the stored driving data; suddenly, retrieving black box data became as easy as downloading from the Internet and the need for “expert” evidentiary standards was thrown into doubt.⁷

State and local police agencies across the country are steadily making analysis of black box data a routine component of reconstruction testimony in prosecutions for motor vehicle homicide, operating under the influence, and driving to endanger, among other highway offenses.⁸ As a result, concerns that

causes of accident, aiding design of crashworthy vehicles, identifying safety problems, and predicting consequences of automobile design trends on accident rates. *Id.* at 2. This data would be invaluable to car manufacturers, who could use it to improve car safety systems, predict performance of new proposed safety systems, determine problem areas, evaluate proposed solutions, and calculate victim tolerance to collision. *Id.* at 11. More recently, in 1998, the National Highway Traffic Safety Administration’s Crashworthiness Subcommittee of the Motor Vehicle Safety Research Advisory Committee’s Event Data Recorder Working Group (MVSRAEC) targeted areas for improvement through the use of recorder data: vehicle systems such as airbags, highway systems such as roadside obstacles, regulatory initiatives, investigations of design defects such as unintended acceleration, litigation of claims such as airbag defects, driver conduct, and law enforcement. MOTOR VEHICLE SAFETY RESEARCH ADVISORY COMM., CRASHWORTHINESS SUBCOMMITTEE EVENT DATA RECORDER WORKING GROUP MEETING #1 MINUTES 66 (Oct. 2, 1998) (*analyzed in* Katz, *supra* note 3, at 171-72), *available at* http://www-nrd.nhtsa.dot.gov/edr-site/uploads/5218-1—Meeting_Minutes—MVSRAEC—EDR_Working_Group-10-2-98.pdf; *see also infra* Part II.A.2 (discussing government agency uses for black box data).

5. *Infra* note 69 and accompanying text (discussing uses by civil defendants of EDR data); *see also* Donnelly, *supra* note 3, at 44-45 (noting judicial skepticism toward EDR admissibility due to recorder technology’s newness).

6. *See* *Librado v. M.S. Carriers, Inc.*, No. 3:02-CV-2095-D, 2004 U.S. Dist. LEXIS 12203, at *31 (N.D. Texas June 30, 2004) (addressing recorder data admissibility under federal scientific evidence standard in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579, 592 (1993)); *Bachman v. Gen. Motors Corp.*, 776 N.E.2d 262, 282-83 (Ill. App. Ct. 2002) (addressing recorder data admissibility under older scientific evidence standard in *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923)); *Brill-Edwards v. Ryder Truck Rental, Inc.*, Civ. No. 3:01cv915, 2003 U.S. Dist. LEXIS 25329, at *5 (D. Conn. 2003) (finding analysis of recorder-retrieval system not expert testimony); *see also infra* notes 92-95 and accompanying text (discussing *Brill-Edwards* alternative approach to admissibility).

7. Press Release, Vetronix Corp., Vetronix Corporation Launches the Crash Data Retrieval (CDR) System (Mar. 9, 2000) (announcing release of laptop retrieval system for downloading and displaying General Motors recorder data), *available at* <http://www-nrd.nhtsa.dot.gov/edr-site/uploads/CDRpress.pdf>. Vetronix partnered with several automobile manufacturers, most notably General Motors, in developing the retrieval system. *Id.*; *see also* Christian Harlan Moen, *California Protects “Black Box” Auto-Crash Data From Disclosure*, 39-DEC TRIAL 62, 62 (2003) (describing Vetronix retrieval system, price of \$2,500; noting recorders not in every car); *infra* notes 55-62 and accompanying text (explaining EDR data retrieval methods).

8. *See generally, e.g.*, *People v. Knight*, 2004 Cal. App. Unpub. LEXIS 2982 (Cal. Ct. App. 2004) (using

never arose in the civil context, from evidentiary matters to questions of constitutional rights, are becoming unavoidable issues in prosecutions for driving offenses.⁹ The answers may well determine the future of roadside police work and driver prosecutions.¹⁰

Prosecutors face two key evidentiary issues concerning black box data admissibility.¹¹ First, the data must be held admissible under the relevant standard for testimony by expert crash reconstructionists; almost all jurisdictions apply either the federal *Daubert*¹² test, which interprets Federal Rule of Evidence 702,¹³ or the older *Frye*¹⁴ test.¹⁵ Second, for the data to be of any practical use, the prosecutor must show that the data has probative value in establishing the driver's conduct.¹⁶ In civil cases, the latter hurdle has proven the more difficult to overcome, but the passage of time and an accompanying rise in use of automotive black boxes may bring greater judicial endorsement of the data's probative value.¹⁷

black box data in reconstruction of gross vehicular manslaughter while intoxicated and related offenses); *People v. French*, 2003 Cal. App. Unpub. LEXIS 3917 (Cal. Ct. App. 2003) (using black box data in reconstruction of vehicular manslaughter resulting from defendant striking another vehicle); *People v. Hopkins*, 2004-0338, 2004 N.Y. Misc. LEXIS 2902 (N.Y. County Ct. Aug. 30, 2004) (using black box data in reconstruction of second degree murder, reckless driving, and speeding); *People v. Christmann*, 776 N.Y.S.2d 437 (N.Y. J. Ct. 2004) (using black box data in reconstruction of automobile fatality resulting from defendant speeding).

9. See *infra* Part II.C (discussing history of constitutional and evidentiary issues applicable to EDRs in criminal law). See generally *Hopkins*, 2004 N.Y. Misc. LEXIS 2902 (addressing range of evidentiary and constitutional issues); *Christmann*, 776 N.Y.S.2d 437 (addressing range of evidentiary and constitutional issues).

10. See *infra* Part IV (offering conclusions for future use of EDRs in driver prosecutions).

11. See *infra* Part II.B.2 (discussing history of EDR admissibility issues in civil litigation); *infra* Part II.B.3 (describing widespread judicial skepticism toward EDR probative value in civil litigation).

12. *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579 (1993).

13. FED. R. EVID. 702.

14. *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

15. *Supra* note 6 and accompanying text (describing several attempts to resolve admissibility of EDRs in civil litigation); *infra* Part II.B.2 (detailing evidentiary expert admissibility standards and civil decisions on EDR admissibility).

16. *Sipes v. Gen. Motors Corp.*, 946 S.W.2d 143, 153 (Tex. App. 1997) (expressing skepticism toward proper functioning of black box computer). The *Sipes* court expressed a common concern when it exhorted that “[o]ur judicial system has never accepted computers or [automotive black boxes] to decide ultimate issues in lieu of courts and juries.” *Id.*; see *infra* Part II.B.3 (discussing judicial skepticism toward probative value of EDR data).

17. See, e.g., Fred Galves, *Where the Not-So-Wild Things Are: Computers in the Courtroom, the Federal Rules of Evidence, and the Need for Institutional Reform and More Judicial Acceptance*, 13 HARV. J.L. & TECH. 161, 300 (2000) (urging widespread acceptance of courtroom computer display technology; chafing at resistance); Sheila K. Hyatt, *Developments in the Law of Scientific Evidence: The Admissibility of Polygraph Evidence*, 18 J. NAT'L ASS'N ADMIN. L. JUDGES 171, 184-85 (1998) (linking policy arguments such as “usurps the jury’s prerogative” with “we just don’t like it” exclusion); Timothy B. Henseler, Comment, *A Critical Look at the Admissibility of Polygraph Evidence in the Wake of Daubert: The Lie Detector Fails the Test*, 46 CATH. U. L. REV. 1247, 1260-66 (1997) (contrasting state admissibility decisions for polygraphs and noting some experiments with admissibility rejected by legislatures); Jeffrey A. Norman, Comment, *DNA Fingerprinting: Is It Ready for Trial?*, 45 U. MIAMI L. REV. 243, 259 (1990) (expressing concern over use of DNA technology before development of methods to harness probative potential). See generally *Wilson v. State*, 328 S.W.2d 311

The introduction of automotive black box data into criminal cases raises two constitutional problems that never applied in the civil context.¹⁸ The Fourth Amendment of the United States Constitution prohibits unreasonable searches and seizures.¹⁹ The United States Supreme Court, however, has held that the expectation of privacy, which is inseparable from the right to be free from unreasonable searches and seizures, is diminished in the automobile.²⁰ This automobile exception, though it originated in police enforcement of warrantless prohibition-era contraband liquor searches, has been extended by federal and state courts to encompass searches backed by reasonable cause of other offenses.²¹ The automobile exception may be the key to admitting black box data seized at a time when police simply could not take the time to get to a courthouse and obtain a search warrant.²²

Another constitutional issue implicated by automotive black boxes concerns the Fifth Amendment privilege against compulsory self-incrimination.²³ While black box data may potentially incriminate the automobile owner, the Supreme Court has excused statutes requiring disclosure of driver name and address in automobile accidents if the statute is “noncriminal and self-reporting is indispensable to its fulfillment.”²⁴ This exception may advance automotive black box data, for years recommended by government agencies as a means of

(Tex. Crim. App. 1959) (surveying evolution of radar device admissibility and probative value).

18. See *infra* notes 19-22 and accompanying text (introducing Fourth Amendment issues); *infra* notes 23-25 and accompanying text (introducing Fifth Amendment issues).

19. U.S. CONST. amend. IV. “The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.” *Id.*

20. *South Dakota v. Opperman*, 428 U.S. 364, 376 (1976) (holding warrantless search of impounded automobile “not ‘unreasonable’ under the Fourth Amendment”). The Court contrasted “the inherent mobility of automobiles,” everyday noncriminal contact of law enforcement with automobiles, the public nature of automobile travel, frequent police traffic-control operations, and authority of police to impound vehicles, against the expectation of privacy in one’s home or office. *Id.* at 367-69; *infra* notes 112-113 and accompanying text (discussing diminished expectation of privacy applicable to automobiles).

21. *Carroll v. United States*, 267 U.S. 132, 155-56 (1925) (requiring officer have probable cause for believing automobile stopped had contraband liquor being illegally transported). The Court had earlier defined probable cause as “[i]f the facts and circumstances before the officer are such as to warrant a man of prudence and caution in believing that the offence has been committed, it is sufficient.” *Stacey v. Emery*, 97 U.S. 642, 645 (1878); see also *United States v. Akram*, 165 F.3d 452, 456 (6th Cir. 1999) (permitting search of vehicle pulled over for speeding based on probable cause for narcotics); *Commonwealth v. Nicholson*, 792 N.E.2d 124, 128 (Mass. App. Ct. 2003) (applying *Opperman* doctrine to evidence of intoxication during an Operating Under the Influence arrest); *infra* Part II.C.2 (discussing Fourth Amendment, automobile exception, and related doctrines).

22. But see Keith S. Hampton, *Stranded in the Wasteland of Unregulated Roadway Police Powers: Can “Reasonable Officers” Ever Rescue Us?*, 35 ST. MARY’S L.J. 499, 551 (2004) (fearing recent automobile exception jurisprudence opens door to limitless searches requiring only pretextual arrest).

23. U.S. CONST. amend. V (exhorting “[n]o person . . . shall be compelled in any criminal case to be a witness against himself”).

24. *California v. Byers*, 402 U.S. 424, 431 (1971) (noting “disclosures with respect to automobile accidents simply do not entail . . . substantial risk of self-incrimination”).

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reducing roadway dangers, past the constitutional bar against self-incrimination.²⁵

Part II of this Note will examine the historical development of Event Data Recorders (EDRs), more commonly known as automotive “black boxes.”²⁶ Part II.A will discuss the technical and legal development of EDRs in industry and government.²⁷ This Note will then examine uses of EDRs in civil litigation in Part II.B., including factual context, admissibility, and probative value.²⁸ Part II.C will then examine the history of the relevant criminal law issues, including uniquely criminal constitutional questions and recent case law.²⁹

This Note will then analyze the criminal law applications of EDRs in Part III.³⁰ Part III.A will discuss EDR ownership, admissibility under the Constitution, and evidentiary standards of admissibility.³¹ Probative value to criminal case factfinders will be discussed in Part III.B.³² This Note will conclude in Part IV that EDRs should be exempt from the Fourth Amendment warrant requirement, not considered self-incrimination under the Fifth Amendment, admissible under all major evidentiary standards, and probative to criminal factfinders.³³

25. NAT'L HIGHWAY TRAFFIC SAFETY ADMIN. EVENT DATA RECORDER (EDR) WORKING GROUP, SUMMARY OF FINDINGS 55 (2001) (touting public safety benefits of potential crash data archive), available at http://www-nrd.nhtsa.dot.gov/edr-site/uploads/edrs-summary_of_findings.pdf.

26. See *infra* Part II.

27. See *infra* Part II.A.1.a (discussing transportation recorders in various industries); *infra* Part II.A.1.b (discussing technical functioning of automotive EDRs); *infra* Part II.A.2 (discussing government agency uses for EDRs, with focus on National Highway Traffic Safety Administration (NHTSA)).

28. See *infra* Part II.B.1 (discussing factual background of typical civil litigation concerning EDRs); *infra* Part II.B.2 (discussing admissibility standards, applications to EDRs, and other evolving technologies); *infra* Part II.B.3 (discussing reluctance of courts to afford EDR data substantial probative value).

29. See *infra* Part II.C.1 (discussing overarching issue of data ownership); *infra* Part II.C.2 (discussing Fourth Amendment automobile exception, vehicle searches, roadside versus impounded searches, and container searches); *infra* Part II.C.3 (discussing Fifth Amendment); *infra* Part II.C.4 (discussing *Christmann* and other EDR criminal cases).

30. See *infra* Part III (discussing criminal law applications of EDRs).

31. See *infra* Part III.A.1 (discussing ownership of EDRs and their data); *infra* Part III.A.2 (discussing Fourth Amendment as applied to EDRs); *infra* Part III.A.3 (discussing Fifth Amendment as applied to EDRs); *infra* Part III.A.4 (discussing application of evidentiary admissibility standards to EDRs).

32. See *infra* Part III.B (discussing probative value of EDRs to criminal factfinders).

33. See *infra* Part IV (offering conclusions on future of EDRs in criminal context).

II. HISTORY

A. EDRs: *What They Are and What They Do*

1. *Technical Background*

a. *Evolution in Transportation Industries*

Automotive EDRs are analogous to earlier recorder technologies employed in other transportation industries.³⁴ The airline industry has used Flight Data Recorders (FDRs) extensively since the 1950s, and this use has been subject to significant government regulations.³⁵ In addition to FDRs, airlines also employ Cockpit Voice Recorder (CVR) technology, popularly known as airplane “black boxes.”³⁶ Compromises between privacy rights and accident investigations that played out years ago in the airline context may shed light on

34. JOE T. CORREIA ET AL., UTILIZING DATA FROM AUTOMOTIVE EVENT DATA RECORDERS 1-2 (2001) (detailing uses and regulations of recorder technology across aviation, marine, railway, and highway transportation), *available at* http://www-nrd.nhtsa.dot.gov/edr-site/uploads/Utilizing_Data_from_Automotive_Event_Data_Recorders.pdf.

35. 14 C.F.R. § 135.152 (2004) (regulating FDRs); U.S. DEP’T OF TRANSP., FED. MOTOR CARRIER SAFETY ADMIN., A REPORT TO CONGRESS ON ELECTRONIC CONTROL MODULE TECHNOLOGY FOR USE IN RECORDING VEHICLE PARAMETERS DURING A CRASH 9 (2001) (noting flight recorders, used since 1950s, now record hundreds of parameters over twenty-five hours), *available at* <http://www-nrd.nhtsa.dot.gov/edr-site/uploads/4thRpt2Congr.pdf>; *see* Uris, *supra* note 2, at 996-97 (noting NHTSA proved recorders “valuable in understanding and decreasing the number of airline crashes”). Government and industry regulations have covered FDRs for decades. *See* CORREIA ET AL., *supra* note 34 at 2 (noting early 1940s Civil Aeronautics Board (CAB) regulation “[called] for flight recording device, but later rescinded”). The Civil Aviation Authority required analog FDRs to record time, altitude, airspeed, vertical accelerations, and heading. *Id.* The Federal Aviation Authority requires a seventeen-parameter digital FDR on twenty-person transports certified after 1969. *Id.* (citing 14 C.F.R. § 121.343 (2004)). FAA regulations now require post-August 19, 2002 transports to record eighty-eight data parameters on digital recorders. 14 C.F.R. § 135.152 (2004) (defining “flight recorders;” enumerating eighty-eight parameters for digital recorders); *see also* CORREIA ET AL., *supra* note 34 at 2 (noting required eighty-eight parameter minimum (citing 14 C.F.R. § 121.344 (2004))).

36. 14 C.F.R. § 135.151 (2004) (regulating, under FAA authority, CVR presence, microphone types, erasure of recordings, variation by plane capacity); CORREIA ET AL., *supra* note 34 at 2 (noting early CAB recommendation of recording flight crew conversations); Donald C. Massey, *Proposed On-board Recorders for Motor Carriers: Fostering Safer Highways or Unfairly Tilting the Litigation Playing Field?*, 24 S. ILL. U. L.J. 453, 460 (2000) [hereinafter Massey, *On-Board Recorders*] (estimating CVR “most recognizable” electronic transportation data recorded; noting mandatory CVR requirements and initial controversy). Under FAA regulation 14 C.F.R. § 121.359 (2004), airplanes are “required to carry [a] CVR capable of recording [the] last 30 minutes of conversations.” CORREIA ET AL., *supra* note 34, at 2 (citing 14 C.F.R. § 121.359 (2004)). The creation of CVRs spurred early privacy criticisms that have resurfaced decades later in the automotive recorder context. Uris, *supra* note 2, at 999 (noting Australian government early compared CVRs to “a spy flying alongside . . . with Big Brother listening” (quoting DEP’T OF DEF., THE BLACK BOX: AN AUSTRALIAN CONTRIBUTION TO AIR SAFETY, THE DEFENCE SCIENCE AND TECHNOLOGY ORGANIZATION (“DTSO”), *at* <http://www.dsto.defence.gov.au/corporate/history/jubilee/blackbox.html> (last visited Mar. 15, 2002))).

emerging automotive EDR issues.³⁷ Any such analogy is precarious, however, given significant differences between the isolated nature of air transport and the nonexclusive space traveled by cars.³⁸

EDR regulations for railroad Locomotive Event Recorders (LERs) were enacted more recently than those for airlines, but LERs are more accessible to parties pursuing litigation.³⁹ LERs, however, record far fewer parameters than their airplane counterparts.⁴⁰ Railroad civil litigation has produced a general consensus that LER data is both admissible and accurate.⁴¹ Unfortunately, application of LER law to automotive EDRs suffers from the same dissimilarities as FDR law.⁴²

Closer analogs to automotive EDRs can be found in maritime Voyage Data Recorders (VDRs) and commercial trucking On-Board Recorders (OBRs), the

37. 49 U.S.C. § 1114(c) (2000) (restricting National Transportation Safety Board (NTSB) disclosure of CVR recordings regarding accidents under non-public investigation); 49 U.S.C. § 1154 (2000) (deferring to NTSB discretion for disclosure but enumerating exceptions for judicial proceedings depending on necessity); Massey, *On-Board Recorders*, *supra* note 36, at 460 (noting compromise limited recording duration, allowed post-landing erasing ability, and limited disclosure to accident investigations); Massey, *On-Board Recorders*, *supra* note 36, at 460-61 (noting CVRs exempt from public disclosure via Freedom of Information Act requests made upon NTSB).

38. Massey, *On-Board Recorders*, *supra* note 36, at 461-62 (noting “discreet . . . exclusive space” of air traffic isolated from other vehicles and similar ground restrictions). Massey also emphasized both that crashes between aircraft allow fair comparison of like data because both aircraft have similar recorders and that airplane disaster victims are often unavailable because they are dead. *Id.*

39. See 49 U.S.C. § 1114(d) (2000) (restricting National Transportation Safety Board (NTSB) disclosure of LER recordings regarding accidents under non-public investigation); 49 U.S.C. § 1154 (2001) (deferring to NTSB disclosure discretion but enumerating exceptions for judicial proceedings depending on necessity); U.S. DEP’T OF TRANSP., FED. MOTOR CARRIER SAFETY ADMIN., *supra* note 35, at 9 (noting LDRs implemented for management in 1970s and mandated by Federal Railroad Administration (FRA) in 1995). Massey emphasized the stark contrast between the restriction of CVRs to accident investigation and the “well settled” ability of the FRA to employ LERs “for purposes other than accident investigation.” Massey, *On-Board Recorders*, *supra* note 36, at 461 (noting “[f]or the most part, railroad event recorders are discoverable” in railroad civil litigation); Donald C. Massey, *Discovery of Electronic Data from Motor Carriers—Is Resistance Futile?*, 35 GONZ. L. REV. 145, 173 (2000) (noting FRA may use data to determine civil penalties, courts may admit data as evidence).

40. 49 C.F.R. § 229.5 (2004) (enumerating LER definitions); CORREIA ET AL., *supra* note 34, at 2 (noting FRA requires speed, direction, time, distance, throttle, brakes, signals, over last forty-eight hours (citing 49 C.F.R. § 229.5 (2004); 49 C.F.R. § 135 (2004))); U.S. DEP’T OF TRANSP., FED. MOTOR CARRIER SAFETY ADMIN., *supra* note 35, at 9 (noting LERs “record only a minimal number of parameters” and meet no disaster survivability requirements).

41. *Hostetler v. Consol. Rail Corp.*, 123 F.3d 387, 389 n.2 (6th Cir. 1997) (noting parties stipulated as to LER printout accuracy); *Stuckey v. Illinois Cent. R.R. Co.*, No. 2:96CV47-B-B, 1998 U.S. Dist. LEXIS 2648, at *15, *17-*18 (N.D. Miss. Feb. 9, 1998) (admitting LER data; finding against plaintiffs who failed to contradict LER corroborated by eyewitnesses); *Nat’l R.R. Passenger Corp. v. H & P, Inc.*, 949 F. Supp. 1556, 1562-63 (M.D. Ala. 1996) (attributing great credibility to accident description relying on and “backed up by” LER data); *Griffin v. Kansas City S. Ry. Co.*, 965 S.W.2d 458, 463 (Mo. Ct. App. 1998) (stating LER data “provided sufficient evidence from which the jury could infer . . . sufficient stopping distance”).

42. Massey, *On-Board Recorders*, *supra* note 36, at 461-62 (describing trains as operating in discreet, exclusive tracks with exclusive right of way). As with aircraft, train-on-train crashes involve two vehicles that are both equipped with LERs; train crashes with other vehicles are simply a matter of “either the train was traveling within defined parameters or not.” *Id.* at 462.

latter operating in a travel environment almost indistinguishable from that of consumer automobiles.⁴³ Regulations for each matured in the 1990s, though law requires neither VDRs nor OBRs to maintain dozens of data parameters as FDRs are required to do.⁴⁴ OBRs now function as one of numerous recording and tracking systems used in commercial trucking.⁴⁵

Automotive EDRs (hereinafter EDRs) emerged from early uses of recorded airbag systems data in the 1970s but did not become a key highway safety research tool until General Motors developed means to store and retrieve airbag data in the 1990s.⁴⁶ Commentators often liken EDRs to FDRs and CVRs because storage of EDR data, like flight data, is most often triggered by crash events.⁴⁷

b. Mechanics: How EDRs Operate

EDR operation is best understood in three parts: a cycle-breaking triggering process for recording, a range of data parameters recorded, and a data

43. Massey, *On-Board Recorders*, *supra* note 36, at 458 (noting all heavy trucks since early 1990s contain OBRs recording information similar to FDRs and LERs); CORREIA ET AL., *supra* note 34, at 2 (indicating use of VDRs extends back to mid-1970s, OBRs back to late 1980s). Commercial trucks must share highway space, like consumer automobiles and unlike “discreet” airplanes and trains; there is also a high likelihood that a trucking accident will involve one or more vehicles not equipped with an EDR, unlike air and rail accidents, which generally involve only other vehicles of the same type—and equipped with the same EDRs. Massey, *On-Board Recorders*, *supra* note 36 at 462. *But see id.* at 456-57 (likening OBRs to CVRs where OBRs record “much of what drivers do in their job”); AUGUSTUS “CHIP” B. CHIDESTER ET AL., REAL WORLD EXPERIENCE WITH EVENT DATA RECORDERS 2 (2001) (describing current marine recorders as “very rudimentary” and limited in use to determining accident causation), available at http://www-nrd.nhtsa.dot.gov/edr-site/uploads/Real_world_experience_with_event_data_recorders.pdf.

44. CORREIA ET AL., *supra* note 34, at 2 (charting initial 1976 VDR recommendation and 1988 OBR regulation, neither of which intensified until 1990s (citing NTSB Recommendation M-76-8 and 49 C.F.R. § 395.15)). Regulations now require passenger ships to carry VDRs capable of recording twelve hours of fourteen parameters, including navigation information and communications audio. *Id.* (citing International Convention for Safety of Life at Sea, Nov. 1, 1974, ch. V, Reg. 20, 32 U.S.T. 47; International Marine Organization Resolution A.861(20)). NTSB recommendations to government agencies and trucking industry groups urge automated, tamper-proof OBRs for recording trip statistics. *Id.* (citing NTSB Recommendation H-90-28; NTSB Recommendation H-98-23). The NTSB has also recommended requirements for buses to record seventeen parameters and uniform crash data. *Id.* (citing NTSB Recommendation H-99-53; NTSB Recommendation H-99-54).

45. Massey, *On-Board Recorders*, *supra* note 36, at 459 (enumerating and detailing six recording-tracking systems based on events, loops, satellites, hours, trips, collisions).

46. *Supra* note 3 and accompanying text (describing evolution of EDR parameter collection). The increase in parameters stored has spurred predictions “that someday every vehicle on the road will be equipped” with an EDR. Donnelly, *supra* note 3, at 41-42 (noting NHTSA considering requiring EDRs in all new vehicles).

47. *See, e.g.*, Moen, *supra* note 7, at 62 (comparing EDRs to CVRs); Katz, *supra* note 3, at 163 (likening EDRs to CVRs); NAT’L HIGHWAY TRAFFIC SAFETY ADMIN., EVENT DATA RECORDER (EDR) RESEARCH HISTORY 1-2 (2001) (emphasizing collection of data at time of airbag deployment), available at http://www-nrd.nhtsa.dot.gov/edr-site/uploads/research_history.pdf; Associated Press, *GM Installs ‘Black Boxes’ in Cars*, USA TODAY, Nov. 23, 1999 (analogizing EDRs to CVRs), available at http://www-nrd.nhtsa.dot.gov/edr-site/uploads/USAToday—GM_installs_black_boxes_in_cars.pdf.

downloading retrieval method.⁴⁸ The cycle of an EDR is a continuous loop of several seconds during which a snapshot of vehicle information is read by and held in the memory of an airbag Sensing Diagnostic Module (SDM) each second; upon the close of the loop, a new loop begins and the old information is replaced.⁴⁹ When the cycle breaks, the currently-recorded data is frozen for later retrieval in an Event Data Retrieval Unit (EDRU).⁵⁰ Airbag events that break cycles are sensed by the SDM to cause either “deployment” or “near deployment” of the airbag.⁵¹

The data recorded by EDRs varies by manufacturer, but at minimum includes all information necessary for the airbag system to function.⁵² Full EDR systems record change in velocity and use of numerous automobile functions ranging from lights to brakes to seatbelts.⁵³ EDRs are therefore

48. See U.S. DEP’T OF TRANSP., FED. MOTOR CARRIER SAFETY ADMIN., *supra* note 35, at 17-27 (detailing and diagramming EDR functioning divided into data processing, data storage, data retrieval, power supply).

49. Moen, *supra* note 7, at 62 (stating loop period usually five seconds); CHIDESTER ET AL., *supra* note 43, at 3 (describing recirculating RAM buffer, one storage location per parameter stored, data sets recorded every second). “SDM” is the name of the General Motors module. CHIDESTER ET AL., *supra* note 43, at 3 (noting SDM replaced earlier “Diagnostic and Energy Reserve Module” (DERM) in 1994).

50. Perez-Trujillo v. Volvo Car Corp., 137 F.3d 50, 52 (1st Cir. 1998) (noting sensor circuits burn out upon cycle interruption and cannot record further data); Uris, *supra* note 2, at 1001 (noting EDRUs constantly “on” but record only last five seconds preceding cycle-breaking event); CHIDESTER ET AL., *supra* note 43, at 3 (noting buffer refreshing suspends upon cycle interruption in General Motors automobiles). According to an SDM design engineer, while certain diagnostic codes could be erased, SDMs are “specifically designed to prevent” alteration or erasure of recorded data. Bachman v. Gen. Motors Corp., 776 N.E.2d 262, 272 (Ill. App. Ct. 2002) (noting power loss during crash “would not affect data previously recorded”). *But see* Perez-Trujillo, 137 F.3d at 54 (conceding sensor may record false cycle-interruption event, despite expert testimony sensor cannot record without event); CHIDESTER ET AL., *supra* note 43, at 3 (noting asynchronous cycle interruption and data transmission may skew data from interruption by one second).

51. Bachman, 776 N.E.2d at 271-72 (noting manufacturer based “events” on what would or almost would require airbag protection); Cansler v. Mills, 765 N.E.2d 698, 706 (Ind. Ct. App. 2002) (noting threshold deployment velocity for General Motors vehicle hitting wall at nine to fifteen m.p.h. (citing 1994 Corvette Owner’s Manual)); People v. Christmann, 776 N.Y.S.2d 437, 439 (N.Y. J. Ct. 2004) (providing event examples of bumping curbs, hitting potholes, suddenly slamming brakes); Katz, *supra* note 3, at 169-70 (noting many General Motors EDRs record upon “near-deployment” events insufficiently severe for airbags to deploy (quoting Augustus “Chip” Chidester et al., Recording Automotive Crash Event Data, Int’l Symposium on Transp. Recorders, May 3-5, 1999, Arlington, Va., at <http://www.nhtsa.dot.gov/cars/problems/studies/record/chidester.htm>)). Some EDRs, triggered by threshold deceleration, produce data recordings delayed five to six milliseconds after impact starts. ALOKE PRASAD, U.S. DEP’T OF TRANSP., PERFORMANCE OF SELECTED EVENT DATA RECORDERS 3 (2001) (listing DriveCam, IWI, Ford; noting Ford RCM compensates shifting time zero five to six msec), available at <http://www-nrd.nhtsa.dot.gov/pdf/nrd-10/EDR/EDR-round-robin-Report.pdf>. *But see* Perez-Trujillo, 137 F.3d at 54 (noting Volvo did not deny possibility of sensor mistaking normal conditions for “low violence” crash); Cansler, 765 N.E.2d at 706 (noting threshold velocity higher if object struck moves, no inflation upon side or rear impacts).

52. Katz, *supra* note 3, at 169-70 (noting General Motors systems have recorded airbag status and crash severity since 1974 (quoting Augustus “Chip” Chidester et al., Recording Automotive Crash Event Data, Int’l Symposium on Transp. Recorders, May 3-5, 1999, Arlington, Va., at <http://www.nhtsa.dot.gov/cars/problems/studies/record/chidester.htm>)); Bachman, 776 N.E.2d at 272 (including airbag error deployment diagnostic codes).

53. Vetronix Corp., *supra* note 7, at 1 (enumerating data recorded; including, for some airbags, status of

capable of disclosing that a driver was going a bit too fast, hit the brakes a bit too late, and never buckled his seatbelt—or vice versa.⁵⁴

Data retrieval technology had been largely proprietary and inconvenient until 2000, when Vetronix Corporation released the Crash Data Retrieval System (CDR), which allows a user to connect a notebook computer to an EDR, download the recorded information, and display the data as graphs and tables.⁵⁵ This technology allows anyone, including police, to download SDM data without endangering the SDM recording itself.⁵⁶ Users can download the data long before the recording is erased by either 250 subsequent ignitions of the vehicle or jarring of the recorder module.⁵⁷ As the CDR and similar devices become compatible with more EDRs, the retrieval process will become entirely independent of manufacturers, once the sole source of EDR data

dashboard Malfunction Indicator Light (MIL)). Change in velocity is recorded as a delta-V or DV number calculated by the SDM. *Id.* See generally PRASAD, *supra* note 51 (comparing DV and crash pulse accuracy across various EDR models). General Motors has recorded an SDM-computed crash DV since the 1994 SDM; in 1999, pre-crash data for velocity, engine RPM, engine throttle opening, and brakes were added. CHIDESTER ET AL., *supra* note 43, at 3; NAT'L HIGHWAY TRAFFIC SAFETY ADMIN. EVENT DATA RECORDER (EDR) WORKING GROUP, *supra* note 25, at 27 (charting parameters recorded by 1990 DERM, 1994 SDM, 1999 SDM, respectively), available at http://www-nrd.nhtsa.dot.gov/edr-site/uploads/edrs-summary_of_findings.pdf. The Ford Restraint Control Module (RCM) records longitudinal and lateral acceleration crash pulse (which produces DV), airbag deployment, seatbelts, and driver seat position. CHIDESTER ET AL., *supra* note 43, at 3-4.

54. Little-known “Black-box” Technology on Cars Helps Diagnose Accidents, DALLAS MORNING NEWS ONLINE, May 11, 2000 (noting such scenario “perhaps to the chagrin of an injured motorist seeking a settlement”), available at http://www-nrd.nhtsa.dot.gov/edr-site/uploads/DallasMorningNews—Little-Known_Black_Box_Tech_Helps_Diagnose.pdf; see also Moen, *supra* note 7, at 62 (noting some EDRs may transmit accident information to central systems); Uris, *supra* note 2, at 1002 (noting EDR “treasure chest” may differentiate brake applications five, three, or one second before impact); NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., *supra* note 47, at 5 (enumerating seventeen EDR parameters required of buses by NTSB Safety Recommendation H-99-53 (citing NAT'L TRANSP. SAFETY BD., SPECIAL INVESTIGATION REPORT 4—BUS CRASHWORTHINESS ISSUE (NTSB/SIR-99/04) (1999)). The Detroit Diesel Electronic Controls IV (DDEC IV), integrated into engines of commercial rigs rather than airbags of consumer cars, records comprehensive engine operating history, speeds, fuel usage, mileage, time engine idling, minutes driving, and 120 seconds of braking deceleration through end of collision. *Librado v. M.S. Carriers, Inc.*, No. 3:02-CV-2095-D, 2004 U.S. Dist. LEXIS 12203, at *33 (N.D. Tex. June 30, 2004) (describing DDEC IV).

55. Vetronix Corp., *supra* note 7, at 1 (enumerating parameters handled and display formats); see also Katz, *supra* note 3, at 170 (noting CDR kits available to General Motors crash investigators, NHTSA, and general public); CHIDESTER ET AL., *supra* note 43, at 5 (illustrating CDR output images; noting CDR works with General Motors SDMs, pending Ford RCM compatibility); CORREIA ET AL., *supra* note 34, at 8 (describing Diagnostic Link Connector (DLC) under dashboard and SDM under front seat or center console); NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., EVENT DATA RECORDERS, REQUEST FOR COMMENTS 11 (2002) (noting CDR connects directly to EDR but wireless EDR-CDR links are in development), available at <http://www-nrd.nhtsa.dot.gov/pdf/nrd-10/EDR/EDR-Notice-Oct-10-02.pdf>; NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., *supra* note 47, at 6 (noting CDR first and only publicly-available EDR downloading device).

56. Vetronix Corp., *supra* note 7, at 1 (noting EDR “information was not easily retrieved and interpreted prior to” Vetronix’s CDR).

57. *People v. Christmann*, 776 N.Y.S.2d 437, 439 (N.Y. J. Ct. 2004) (describing officer connecting wire to SDM). SDM data cannot be modified or corrupted by the CDR because the connection is one-way (downloading) only. *Id.* SDM data is erased either after the ignition is turned on 250 times following the recording or after another deployment or near-deployment event. *Id.* (noting erasure by new event requires ignition turned on).

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analysis.⁵⁸ EDRs in development will automatically transmit both crash data and crash video to a storehouse accessible by law enforcement.⁵⁹

EDR data retrieval is consistently reliable, according to both industry experts and government testing groups.⁶⁰ Errors with the recording process vary by EDR model but the most egregious data errors appear to relate to incorrect airbag deployment rather than SDM recording.⁶¹ At least one court interpreted CDR-generated graphs and charts as a mere presentation of raw EDR data, not involving expert opinion or analysis.⁶²

2. Uses for EDR Data

The government agency most capable of making use of EDR data is the National Highway Traffic Safety Administration (NHTSA), which seeks to improve restraint systems (including seatbelts, airbags, and highway barrier systems) through both independent investigations and efforts coordinated with car manufacturers.⁶³ To this end, NHTSA has sought to make EDRs mandatory, despite manufacturers' privacy concerns.⁶⁴ NHTSA reports

58. *Bachman v. Gen. Motors Corp.*, 776 N.E.2d 262, 277 (Ill. App. Ct. 2002) (requiring General Motors documents for pre-1996 SDM data interpretation; contrasting with later CDR release); CHIDESTER ET AL., *supra* note 43, at 6 (noting prior retrieval methods required sending EDR box to manufacturer or having manufacturer visit crash). To use Ford's retrieval system, either the car must have electrical functionality or the RCM box must be removed and sent to Ford for data retrieval. CHIDESTER ET AL., *supra* note 43, at 6; *see also* *Perez-Trujillo v. Volvo Car Corp.*, 137 F.3d 50, 51-52 (1st Cir. 1998) (requiring airbag sensor sent to Volvo for 1993 testing); *Bachman*, 776 N.E.2d at 272 (requiring, due to loss of car electrical power, external power source for 1997 data retrieval).

59. NAT'L HIGHWAY TRAFFIC SAFETY ADMIN. EVENT DATA RECORDER (EDR) WORKING GROUP, *supra* note 25, at 30-32 (describing Safety Intelligence Systems' Mobile Accident Camera (MACBOX) EDR, encryption, transmission, accessibility).

60. CHIDESTER ET AL., *supra* note 43, at 7 (describing two crash investigation teams with combined download success rate of 94 out of 101). Vetronix has remedied the two problems of General Motors downloading, incorrect cables and software problems; the only Ford problem occurred when removal of the RCM box was impossible because of a damaged electrical system. *Id.*

61. *Perez-Trujillo*, 137 F.3d at 52 n.4 (noting airbag sensors affected by external factors like humidity, six of every 75,000 deployments inadvertent); *see also* *Bachman*, 776 N.E.2d at 273 (noting witness asserted NHTSA never questioned accuracy of SDM data recording; attributing problems to airbag deployment). *But see* *Christmann*, 776 N.Y.S.2d at 439 (noting witness conceded downloading does not prove accuracy; noting lack of testimony on SDM calibration); CHIDESTER ET AL., *supra* note 43, at 7-8 (noting electricity-outage problems with SDM seatbelt and RPM parameters, Ford incomplete recording during electricity failure).

62. *Brill-Edwards v. Ryder Truck Rental, Inc.*, Civ. No. 3:01cv915 (PCD), 2003 U.S. Dist. LEXIS 25329, at *5 (D. Conn. Jan. 23, 2003) (describing sole text as "generic statement describing terms and details relevant to the information displayed").

63. CHIDESTER ET AL., *supra* note 43, at 8-10 (describing initiatives to improve airbags, highway safety designs, regulatory and consumer crash information). Objective EDR information could be used to assess occupant protection technologies and compose a driver behavior database. *Id.* at 9 (asserting EDRs sole means of assessing protection technologies; listing database parameters: braking, steering, seatbelts, speed); *see also* U.S. DEP'T OF TRANSP., FED. MOTOR CARRIER SAFETY ADMIN., *supra* note 35, at 12 (noting NHTSA also promulgates Federal Motor Vehicle Safety Standards).

64. *Compare* CHIDESTER ET AL., *supra* note 43, at 10 (including among numerous EDR recommendations mandatory installation "in all [automobiles] sold in the United States") *with* U.S. DEP'T OF TRANSP., FED. MOTOR CARRIER SAFETY ADMIN., *supra* note 35, at 16 (listing seven privacy-protection requirements

supporting EDRs may themselves be admissible in civil litigation as either public agency statements or admissions of a party-opponent.⁶⁵ Studies have shown that drivers who are aware of the presence of their EDRs tend to drive more carefully, thus reducing accidents and further protecting the safety of the general public.⁶⁶ Key to criminal law, however, is the potential for police investigations and reconstructions of road accidents that EDRs offer.⁶⁷

B. EDRs in Civil Litigation

1. Factual Context

Most of the civil litigation dealing with EDRs involves product liability actions against automobile manufacturers in which the plaintiff claims damages arising out of defects in the construction or deployment of an airbag.⁶⁸ Typically, a defendant seeks to use EDR data to prove either that the impact preceded deployment of the airbag or that there was no impact sufficient to properly cause airbag deployment.⁶⁹ The two dominant issues then become whether EDR data is admissible as part of crash reconstructionist testimony and

demanded by American Trucking Associations, Inc.).

65. *Perez-Trujillo v. Volvo Car Corp.*, 137 F.3d 50, 54 n.8 (1st Cir. 1998) (citing FED. R. EVID. 801(d)(2) and FED. R. EVID. 803(8)(a)).

66. Harry Stoffer, *Promise and Pitfalls Seen in Black Box*, AUTOMOTIVE NEWS, Sept. 17, 2001 (noting driver awareness of EDR presence tends to reduce both “number and severity of crashes”), available at http://www-nrd.nhtsa.dot.gov/edr-site/uploads/automotive_news.pdf; Stichting Wetenschappelijk Onderzoek Verkeersveiligheid [Institute for Road Safety Research], *Black Box Study Shows a Reduction in the Number of Accidents*, SWOV RESEARCH ACTIVITIES, Oct. 8, 1997 (discussing “statistically significant reduction” in accident numbers and recommending “behaviour [sic] influence by driver monitoring”), available at http://www-nrd.nhtsa.dot.gov/edr-site/uploads/Black_box_study_shows_a_reduction_in_the_number_of_accidents.pdf.

67. CHIDESTER ET AL., *supra* note 43, at 9 (noting objective reconstruction data benefits litigation of defects, unintended acceleration, crash-airbag deployment sequence); see *infra* Part II.C.4 (recounting prosecution accident reconstructions based in part on EDR data).

68. See, e.g., *Harris v. Gen. Motors Corp.*, 201 F.3d 800, 801-02 (6th Cir. 2000) (noting plaintiff claimed airbag failed to properly deploy); *Perez-Trujillo*, 137 F.3d at 52 (noting plaintiff asserted strict product liability claim for premature airbag deployment); *Nielsen v. Am. Honda Motor Co.*, 989 P.2d 264, 266 (Haw. Ct. App. 1999) (noting plaintiff claimed car defective when airbag failed to inflate upon impact); *Bachman v. Gen. Motors Corp.*, 776 N.E.2d 262, 271 (Ill. App. Ct. 2002) (noting plaintiff claimed airbag hypersensitive to hazards, negligence of car and airbag manufacturers); *Cansler v. Mills*, 765 N.E.2d 698, 701 (Ind. Ct. App. 2002) (noting plaintiff claimed product liability for airbag failure to deploy); *Sipes v. Gen. Motors Corp.*, 946 S.W.2d 143, 146 (Tex. App. 1997) (noting plaintiff claimed strict liability and negligence for failure of airbag to deploy).

69. See, e.g., *Harris*, 201 F.3d at 804 (noting defendant asserted DERM data suggested airbag “functioned as designed by deploying during the plaintiff’s accident”); *Perez-Trujillo*, 137 F.3d at 52 (noting defendant asserted sensor recorded crash but would have stopped recording before impact if airbag prematurely deployed); *Nielsen*, 989 P.2d at 269 (noting defendant contended computer self-check and digital voltmeter showed airbag fully functional); *Cansler*, 765 N.E.2d at 705 n.2 (noting defendant argued absence of crash detection or fault codes showed undeployed airbag functioned properly by not deploying); *Sipes*, 946 S.W.2d at 153 (noting defendant insisted DERM showed undeployed airbag functioned properly by not deploying).

what the probative value of the data is, once admitted.⁷⁰

2. Admissibility

The *Frye*⁷¹ test for admissibility of scientific expert testimony, which required “general acceptance in the particular field in which [the expert testimony] belongs,” was abandoned in federal courts after seventy years.⁷² In *Daubert v. Merrell Dow Pharmaceuticals, Inc.*,⁷³ the Supreme Court required federal courts to admit only expert testimony that is “(1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue.”⁷⁴ The *Daubert* criteria also apply to technical knowledge.⁷⁵ Although most state courts have adopted the *Daubert* test, some still apply *Frye*.⁷⁶

A three-prong test for scientific devices, which emerged under *Frye* and remains useful even under *Daubert*, places the burden on the proponents of a

70. See *infra* Part II.B.2 (discussing admissibility of EDR data in civil cases).

71. *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

72. *Id.* at 1014. *Frye* today has “only a limited following in some states.” CLIFFORD E. ELIAS, FEDERAL RULES OF EVIDENCE HANDBOOK § 702.3 (Carolina Academic Press 2003) (noting federal courts long debated proper test for scientific evidence admissibility).

73. 509 U.S. 579 (1993).

74. *Id.* at 592. The *Frye* test was notoriously more stringent than the *Daubert* rule, which superseded it on the federal level. *McCulloch v. H.B. Fuller Co.*, 61 F.3d 1038, 1042 (2d Cir. 1995) (stating *Daubert* Court concluded “*Frye*’s rigid standard was inconsistent with . . . liberal thrust of . . . Federal Rules”). Federal Rule of Evidence 702 requires only testimony that is “based on sufficient facts or data” and “the product of reliable principles and methods [applied] . . . reliably to the facts.” FED. R. EVID. 702. The *Daubert* Court listed testing, peer review publication, known or potential rate of error, and general acceptance as key indicators of “scientific knowledge.” *Daubert*, 509 U.S. at 593-94. On remand, the Ninth Circuit described this prong of the test as seeking to ensure that expert testimony was based on the “scientific method” and constituted “good science.” *Daubert v. Merrell-Dow Pharm., Inc.*, 43 F.3d 1311, 1315 (9th Cir. 1995); see also *Librado v. M.S. Carriers, Inc.*, No. 3:02-CV-2095-D, 2004 U.S. Dist. LEXIS 12203, at *30 (N.D. Tex. June 30, 2004) (listing same factors as Ninth Circuit noted in *Daubert* on remand; adding “standards and controls”); ELIAS, *supra* note 72, at 186 (noting crippled *Frye* lingers as “general acceptance” factor of *Daubert*). Compare Thomas M. Crowley, *Help Me Mr. Wizard! Can We Really Have “Neutral” Rule 706 Experts?*, 1998 DET. C.L. REV. 927, 973-976 (1998) (criticizing *Daubert* for testing “scientific knowledge” as starting “gatekeeper” question without defining final inquiry) with G. Michael Fenner, *The Daubert Handbook: The Case, Its Essential Dilemma, and Its Progeny*, 29 CREIGHTON L. REV. 939, 952-54 (1996) (stating *Daubert* allows novel evidence inadmissible under *Frye* but demands more expensive, time consuming foundation).

75. *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 147-48 (1999) (noting “no clear line” divides “scientific” knowledge from “technical” or “other specialized” knowledge); Fenner, *supra* note 74, at 972-73 (stating same considerations of reliability and relevance govern “scientific, technical or other specialized knowledge” (quoting FED. R. EVID. 702; citing FED. R. EVID. 403)). However, administrative agencies such as the NHTSA or NTSB are not subject to the Federal Rules of Evidence or *Daubert*. Fenner, *supra* note 74, at 975 (recommending upholding of administrative agency action unless unconstitutional, “unreasonable, arbitrary, or irrational”).

76. Compare *Commonwealth v. Lanigan*, 641 N.E.2d 1342, 1348-49 (Mass. 1994) (adopting *Daubert* due to risk of withholding reliable evidence from factfinder by strictly applying *Frye*) with *People v. Hopkins*, 2004-0338, 2004 N.Y. Misc. LEXIS 2902, at *36-*41 (N.Y. County Ct. Aug. 30, 2004) (conducting *Frye* analysis ten years after *Daubert*). The Massachusetts Supreme Judicial Court noted that the *Frye* test of general acceptance in the relevant community continues to be a significant, often controlling, factor under the *Daubert* test, but conceded that a court may find reliability even without finding general acceptance. *Lanigan*, 641 N.E.2d at 1348-49.

device to prove: (1) accepted scientific principles, (2) an apparatus both accurately constructed and in good working condition, and (3) a user qualified in using the apparatus by training and experience.⁷⁷ The proponents of a device could prove underlying scientific principles either by expert testimony or, “if notorious,” by judicial notice.⁷⁸ The construction and working condition of the device in question requires expert testimony.⁷⁹ Most disputes over device admissibility center on the fact question prongs of device condition and user qualifications.⁸⁰

Civil trial courts have usually found EDR data admissible, and the vast majority of appeals concerning EDR data have not addressed admissibility.⁸¹ In 2004, however, the U.S. District Court for the Northern District of Texas, in *Librado v. M.S. Carriers, Inc.*,⁸² explicitly addressed the issue of EDR

77. *Wilson v. State*, 328 S.W.2d 311, 313-14 (Tex. Crim. App. 1959) (quoting JOHN H. WIGMORE, *THE SCIENCE OF JUDICIAL PROOF* 450); *see also* *Tex. & N.O. R.R. Co. v. Lemke*, 365 S.W.2d 148, 151 (Tex. 1963) (stating proponents have preliminary burden of proving device accuracy).

78. *Wilson*, 328 S.W.2d at 313 (quoting JOHN H. WIGMORE, *THE SCIENCE OF JUDICIAL PROOF* 450). In *Wilson*, the court discussed the evolution of court opinion regarding radar guns from initially viewing them as innovations requiring expert testimony as to underlying scientific principles to considering them as simple applications of the Doppler effect “experienced by probably every motorist,” to finally concluding that judicial notice of the scientific principles behind the radar gun was appropriate. *Id.* at 312-13 (holding expert testimony unnecessary for “construction, theory and accuracy . . . as a class of scientific instruments”); *see also* *Gandy v. Batchelor*, No. 01-94-00772-CV, 1996 Tex. App. LEXIS 224, at *8 (Tex. App. Jan. 25, 1996) (stating proof of tachograph and tachometer scientific principles “may require expert testimony”).

79. *Wilson*, 328 S.W.2d at 313-14 (emphasizing even jurisdictions admitting radar as prima facie speed evidence require proof of machine accuracy (quoting JOHN H. WIGMORE, *THE SCIENCE OF JUDICIAL PROOF* 450)). Lack of any testimony as to the accuracy of the specific radar unit in question caused the *Wilson* court to reverse the speeding conviction that resulted from admission of the unit’s data. *Id.* at 314; *see also* *Gandy*, 1996 Tex. App. LEXIS 224, at *9-*10 (affirming exclusion of tachograph absent proof of accuracy to explain inconsistent vertical spike in data); *Tex. & N.O. R.R. Co.*, 365 S.W.2d at 150-51 (excluding locomotive speed tape absent proof of tape-ground position correlation or accuracy).

80. Norman, *supra* note 17, at 248-49 (noting improvements of technology and techniques progressively limit objections to device accuracy, then user operation). A challenge to DNA fingerprinting evidence, to be effective, generally must challenge either the tester’s qualifications or the actual performance of the test. *Id.* at 251-52. Similarly, one commentator has urged that polygraph tests be admitted or excluded based on user qualifications. Hyatt, *supra* note 17, at 194 (advising admission if test “properly administered,” examiner licensed and credentialed, subject competent, questions precise). *But see generally* Henseler, *supra* note 17 (attacking polygraphs under *Daubert* for problems relating to all three *Frye*-era device-test prongs).

81. *See, e.g.,* *Perez-Trujillo*, 137 F.3d 50, 54 (1st Cir. 1998) (taking for granted admissibility of Air Bag Deployment Analysis Report (ADAR)); *Nielsen v. Am. Honda Motor Co.*, 989 P.2d 264, 269 (Haw. Ct. App. 1999) (taking for granted admissibility of airbag computer self-checks); *Sipes v. Gen. Motors Corp.*, 946 S.W.2d 143, 153 (Tex. App. 1997) (taking for granted admissibility of DERM data). *But see* *Harris v. Gen. Motors Corp.*, 201 F.3d 800, 804 (6th Cir. 2000) (requiring *Daubert* analysis of DERM data on remand); *Katz*, *supra* note 3, at 176 (noting trial judge accepted EDR as fact but appellate court speculated EDR possibly inadmissible). The *Harris* court stated that “[the court’s] own research did not reveal a single reported case addressing the *Daubert* issue as to General Motors’ automotive ‘black box.’” *Harris*, 201 F.3d at 804 n.2. This was four years before the *Daubert* analysis of *Librado v. M.S. Carriers, Inc.*, No. 3:02-CV-2095-D, 2004 U.S. Dist. LEXIS 12203 (N.D. Tex. June 30, 2004). *See infra* notes 82-85 and accompanying text (discussing *Librado*).

82. No. 3:02-CV-2095-D, 2004 U.S. Dist. LEXIS 12203 (N.D. Tex. June 30, 2004).

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admissibility under *Daubert*.⁸³ The court held that an accident reconstructionist's testimony based in part on a "Hard Brake 1 Report" from a Detroit Diesel Electronic Controls IV "black box" was reliable and therefore admissible under *Daubert*.⁸⁴ The court emphasized that "the speed recorded in the [Hard Brake 1] Report is accurate. Moreover . . . [the] measurements from the Report are often used in accident reconstruction."⁸⁵ Therefore, as one commentator has noted, EDR data that passes *Daubert* forms a sufficient basis for crash reconstruction testimony.⁸⁶

Application of the *Frye* test by the Appellate Court of Illinois in *Bachman v. General Motors Corp.*⁸⁷ provides additional support for the admissibility of EDR data.⁸⁸ The court stated that the process of recording and downloading SDM data is not "a novel technique or method," noting that crash sensors had, at that time, been used in cars for over a decade.⁸⁹ Further, the court found that the loss of electrical power during a crash does not affect the reliability or accuracy of data written to memory prior to power loss, and SDM data is "subject to peer review via the software/hardware codeveloped with or by [General Motors] with Vetronix Corporation."⁹⁰ The court dismissed arguments about confidentiality and uniformity of the SDM system, stating that corporate confidentiality of SDM workings, data compliance with uniform standards, and public accessibility to NHTSA meetings for discussion of uniform standards are irrelevant to acceptance by the relevant scientific community under *Frye*.⁹¹

The U.S. District Court for the District of Connecticut, in *Brill-Edwards v. Ryder Truck Rental, Inc.*,⁹² asserted that Crash Data Retrieval (CDR) output in charts and graphs is merely raw data, divorced from any expert opinion or

83. *Id.* at 31 (considering defendants' assertion that plaintiff relied on unreliable data).

84. *Id.* at 34 (admitting reconstruction expert testimony based on DDEC IV data as reliable).

85. *Id.* at 33 (noting defendants' own expert verified speed recorded by DDEC IV).

86. Katz, *supra* note 3, at 177-78 (qualifying admissibility endorsement with "at least in product liability litigation"). Katz noted that universal installation of EDRs would "ensure an equal playing field in litigation," and distinguished unbiased raw EDR data from potentially prejudicial CVR crash recordings. *Id.* at 178.

87. 776 N.E.2d 262 (Ill. App. Ct. 2002).

88. *Id.* at 283 (holding SDM data admissible under *Frye* test); *see also* Cansler v. Mills, 765 N.E.2d 698, 705 (Ind. Ct. App. 2002) (taking for granted admissibility of DDEC IV data); *infra* notes 97-98 and accompanying text (discussing *Frye* test). *But see* Uris, *supra* note 2, at 1007-08 (contending *Frye* court would not support admissibility of EDRs). Uris distinguished FDRs and CVRs as "designed to trace accidents to a single cause" and dating back to the 1960s, whereas EDRs "record different things" in a "novel" use. *Id.* at 1007.

89. *Bachman*, 776 N.E.2d at 281 (noting EDRs use same microprocessors found in everyday household appliances).

90. *Id.* at 282 (noting articles coauthored by General Motors employees and NHTSA staff, use by police, other agencies).

91. *Id.* at 283 (holding EDR does not create false "perception of certainty" in reconstructionist's expert opinion); *see supra* note 72 and accompanying text (stating *Frye* test).

92. Civ. No. 3:01cv915 (PCD), 2003 U.S. Dist. LEXIS 25329, at *5 (D. Conn. Jan. 23, 2003).

analysis.⁹³ This view, made possible by the ease of displaying data downloaded by a CDR, exempts EDR data from both *Frye* and *Daubert* expert testimony tests.⁹⁴ For now, however, the issue is untried in most jurisdictions because the CDR is a very recent innovation.⁹⁵

3. Probative Value

The Texas Court of Appeals in *Sipes v. General Motors Corp.*⁹⁶ articulated the general skepticism of factfinders toward the probative value of EDR data, stating “[EDR data] is strong evidence if it is shown that the [EDR] itself is functioning properly, but it is not irrefutable evidence that conclusively establishes a fact as a matter of law in the face of other contradictory evidence.”⁹⁷ Federal courts have generally followed this policy, reflected most recently in *Harris v. General Motors Corp.*,⁹⁸ where the Sixth Circuit held a DERM insufficient to establish “undisputed physical facts” as to proper airbag deployment.⁹⁹ Similarly, in *Perez-Trujillo v. Volvo Car Corp.*,¹⁰⁰ the First Circuit rejected the defendant’s “assumption that [the airbag deployment analysis report (ADAR) containing speed data] cannot malfunction and that its unflinching performance can be predicted with absolute certainty in any and all circumstances.”¹⁰¹

State courts are similarly skeptical of the probative value of EDRs, as when the Hawaii Intermediate Court of Appeals held that, where the plaintiff asserted accident conditions that contradicted the defendant’s computer self-check testimony, the defendant failed to prove that the computer self-check system was functioning properly in light of contrary evidence.¹⁰² Likewise, the Indiana Court of Appeals held that “without evidence that the DERM itself was functioning properly, the [data] printout was not irrefutable evidence that the air bag [sic] performed properly.”¹⁰³ Even the *Bachman* court, enthusiastic to admit SDM data under the *Frye* test, refused to reach the issue of probative

93. *Id.* at 5 (stating CDR output merely “presentation of raw data taken from [EDR]”); *supra* note 62 and accompanying text (discussing *Brill-Edwards* court’s reasoning).

94. *See infra* note 126 and accompanying text (noting absence of expert testimony on EDR calibration in *Christmann*).

95. *See supra* notes 55-58 and accompanying text (discussing recent CDR development).

96. 946 S.W.2d 143 (Tex. App. 1997).

97. *Id.* at 153 (holding plaintiffs failed to prove as matter of law that airbag should not have deployed). The court insisted that “[o]ur judicial system has never accepted computers or DERMs to decide ultimate issues in lieu of courts and juries.” *Id.*

98. 201 F.3d 800 (6th Cir. 2000).

99. *Id.* at 804 (noting court’s accompanying failure to find cases applying *Daubert* to EDRs).

100. 137 F.3d 50 (1st Cir. 1998).

101. *Id.* at 54-55 (holding evidence insufficient to prevent rational factfinder accepting contradictory eyewitness testimony).

102. *Nielsen v. Am. Honda Motor Co.*, 989 P.2d 264, 269-70 (Haw. Ct. App. 1999) (quoting *Sipes v. Gen. Motors Corp.*, 946 S.W.2d 143 (Tex. App. 1997)).

103. *Cansler v. Mills*, 765 N.E.2d 698, 705 n.2 (Ind. Ct. App. 2002) (citing *Nielsen*, 989 P.2d at 269).

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value.¹⁰⁴

C. Criminal Law

1. Data Ownership

The threshold inquiry in applying the Fourth and Fifth Amendments to EDR data is whether the owner of the car also owns the data stored by the EDR in his vehicle.¹⁰⁵ The NHTSA unambiguously endorses ownership of the data by the automobile owner, evidenced by NHTSA investigation policies requiring the consent of the automobile owner before accessing the data.¹⁰⁶ The Federal Highway Administration (FHA) agrees, reasoning that free and clear final sale of vehicles to consumers by manufacturers presumably leaves the manufacturer with no interest in either the vehicle or the EDR therein.¹⁰⁷ Ownership remains uncertain, however, because some EDRs may be accessed only by the EDR manufacturer rather than the automobile manufacturer, and because NHTSA policies may be limited to the public agency context.¹⁰⁸

2. The Fourth Amendment

The Fourth Amendment protects the “effects” of citizens from “unreasonable searches and seizures,” and applies to the States through the Fourteenth Amendment.¹⁰⁹ The automobile exception to the Fourth

104. *Bachman v. Gen. Motors Corp.*, 776 N.E.2d 262, 290 (Ill. App. Ct. 2002) (holding plaintiffs forfeited argument on appeal by failing to raise specific objection at trial).

105. U.S. DEP’T OF TRANSP., FED. MOTOR CARRIER SAFETY ADMIN., *supra* note 35, at 13 (asking “who owns the data?”); *see also* Bob Gritzinger, *With Data Recorders, Big Brother is Riding Shotgun* (Nov. 16, 2004) (endorsing “strong rules governing” who owns, can use, and can legally obtain EDR data), at http://www.cars.com/news/stories/pf/111604_storyb_an.jhtml.

106. NAT’L HIGHWAY TRAFFIC SAFETY ADMIN. EVENT DATA RECORDER (EDR) WORKING GROUP, *supra* note 25, at 53 (stating data access by NHTSA requires “a release for the data from the [automobile] owner”). The NHTSA further protects all personal identifiable information from disclosure. *Id.* (stating NHTSA assures owners that personal identifiable information is confidential and may not be disclosed (citing 5 U.S.C. § 552a (2000))).

107. NAT’L HIGHWAY TRAFFIC SAFETY ADMIN. EVENT DATA RECORDER (EDR) WORKING GROUP, *supra* note 25, at 53 (stating manufacturers retain no “vestigial interests” in vehicles). Applying the same final-sale reasoning to EDRs, “the vehicle owner would presumably own the data as well.” *Id.* The FHA acknowledges that this would create significant problems for authorities due to “the obvious practical difficulties of obtaining permission at the crash scene” and allowing the owner “to withhold the data if he felt this would serve his self interest.” *Id.*

108. NAT’L HIGHWAY TRAFFIC SAFETY ADMIN. EVENT DATA RECORDER (EDR) WORKING GROUP, *supra* note 25, at 54 (stating European EDR suppliers control data access through “proprietary protocols” to prevent others accessing data). Some insurance companies believe that an insurance company gains ownership of EDR data if it “gains ownership of the vehicle.” *Id.* Volkswagen believes data ownership depends on consent of persons identified in the data, and both Volkswagen and General Motors pursue a policy of disclosure toward consumers regarding the “monitoring function of the EDR” to retain consumer goodwill. *Id.*

109. U.S. CONST. amend. IV (securing “persons, homes, papers, and effects”); U.S. CONST. amend. XIV, § 1 (protecting from state abridgment federal privileges and immunities, due process, “equal protection of the

Amendment emerged when the Supreme Court, in *Carroll v. United States*,¹¹⁰ stated that a warrantless seizure of contraband from an automobile is excused if the officer had probable cause to believe that the automobile contained contraband being illegally transported.¹¹¹ The Supreme Court in *South Dakota v. Opperman*¹¹² further declared that “inventories pursuant to standard police procedures are reasonable,” even absent probable cause to believe the vehicle contained fruits or evidence of a crime, because automobiles are subject to a diminished expectation of privacy.¹¹³ Despite its legions of critics, the automobile exception now allows full warrantless searches of all containers in an automobile, provided either that the officer has probable cause to believe the containers hold contraband or evidence, or that, during an arrest lacking

laws”).

110. 267 U.S. 132 (1925).

111. See *id.* at 153-55 (distinguishing buildings because drivers can quickly move automobiles out of jurisdiction required to issue warrant). “Probable cause” exists “[i]f the facts and circumstances before the officer are such as to warrant a man of prudence and caution in believing” the fact (here, illegal transportation of contraband) in question. *Stacey v. Emery*, 97 U.S. 642, 645 (1878) (noting officer’s subsequent abuses irrelevant to initial finding of probable cause). “Reasonable” and “probable” cause are synonymous. *Id.* at 646 (stating “[i]f there was a reasonable cause of seizure, there was a probable cause”). Centuries ago, courts at common law distinguished between probable cause to believe that a felony was being committed (which would justify arrests and accompanying warrantless searches) and probable cause to believe that a misdemeanor was being committed (which would not justify arrests or searches); courts no longer make this distinction. Compare *Commonwealth v. Carey*, 66 Mass. 246, 252 (1853) (upholding “marked distinction between felony and misdemeanor” for probable cause to arrest; urging legislative reconsideration) with *Carroll*, 267 U.S. at 158-159 (stating “the character of the offense . . . does not affect the validity of the seizure”). One commentator has emphasized that the automobile in *Carroll* was itself being used as an instrumentality of the crime. 7 PATRICK L. MCCLOSKEY ET AL., CRIMINAL LAW DESKBOOK § 7.06[4] (Matthew Bender & Co. 2004) (noting theory of automobile as instrumentality of crime “runs throughout the automobile exception doctrine”).

112. 428 U.S. 364 (1976).

113. *Id.* at 372-76 (admitting marijuana discovered during inventory of car impounded for parking violations); see also *Cady v. Dombrowski*, 413 U.S. 433, 447 (1973) (admitting firearm removed for public safety from trunk of vehicle impounded after drunk driving crash); *Harris v. United States*, 390 U.S. 234, 236 (1968) (admitting vehicle registration card discovered in regulation-mandated inventory following driver’s arrest as robbery suspect). The *Harris* Court stated that the inventory, required in order “to protect the car while it was in police custody,” was not a “search” under the Fourth Amendment. *Harris*, 390 U.S. at 236. The “diminished expectation of privacy” in automobiles is born of the “inherent mobility of automobiles,” the “obviously public nature of automobile travel,” the “pervasive and continuing governmental regulation and controls, including periodic inspection and licensing requirements” extending to “everyday” stops and examinations by police, and the “routine practice” of local police departments securing and inventorying contents of impounded automobiles. *Opperman*, 428 U.S. at 367-69 (stating inherent mobility of automobiles makes “rigorous enforcements of the warrant requirement . . . impossible”). This conclusion grew from the federalism principle that “[l]ocal police officers, unlike federal officers, frequently investigate vehicle accidents in which there is no claim of criminal liability and engage in . . . community caretaking functions, totally divorced from the detection, investigation, or acquisition of evidence relating to the violation of a criminal statute.” *Cady*, 413 U.S. at 441. But see Carol A. Chase, *Privacy Takes a Back Seat: Putting the Automobile Exception Back on Track After Several Wrong Turns*, 41 B.C. L. REV. 71, 89-92 (1999) (asserting diminished expectation of privacy inapplicable to interior compartments or containers within automobiles). The *Opperman* Court emphasized that probable cause inquiries are irrelevant in “routine administrative caretaking functions” unrelated even as pretext to criminal investigations. *Opperman*, 428 U.S. at 371 n.5.

probable cause to search, the officer is searching the passenger compartment.¹¹⁴ The Supreme Court has demonstrated a trend to not require exigencies for such searches.¹¹⁵ Reflecting this trend, the Appeals Court of Massachusetts has held that police officers are permitted to search for evidence of intoxication “visibly connected as elements of proof of the OUI charge” during an arrest for operating under the influence.¹¹⁶

3. The Fifth Amendment

The Fifth Amendment to the United States Constitution recognizes a privilege of every citizen against compulsory self-incrimination; this privilege applies to states through the Fourteenth Amendment.¹¹⁷ If automobile owners do own the data in their EDRs, then the use of such data against automobile owners in prosecutions could resurrect the contentious split decision of *California v. Byers*.¹¹⁸ In *Byers*, a plurality of the Supreme Court made proverbial roadkill of Fifth Amendment objections to a California statute requiring any driver “involved in an accident resulting in damage to any property including vehicles” to stop and identify himself.¹¹⁹ The plurality first

114. *California v. Acevedo*, 500 U.S. 565, 580 (1991) (allowing search of containers in trunk where probable cause exists); *New York v. Belton*, 453 U.S. 454, 460-61 (1981) (noting arrest justifies infringing privacy; allowing open and closed containers; excluding trunk from “passenger compartment”). *But see Chase*, *supra* note 113, at 81 (criticizing *Acevedo* Court for allowing access to in-automobile containers inaccessible elsewhere). *Chase* also criticized the *Belton* Court for allowing searches without probable cause. *Id.* at 86 (recommending warrant requirement for container-opening searches, if not for container-taking seizures). A legal search encompasses “the entire area in which the object of the search may be found and is not limited by the possibility that separate acts of entry or opening may be required to complete the search.” *United States v. Ross*, 456 U.S. 798, 820-21 (1982) (stating compartments “must give way to . . . prompt and efficient completion of the task at hand”). Probable cause may consist solely of a minor traffic violation. *United States v. Akram*, 165 F.3d 452, 455 (6th Cir. 1999) (finding probable cause due to failure to signal lane change). *But see Chase*, *supra* note 113, at 95 (bemoaning problems of retrospective justification of searches long after such searches turned up incriminating evidence); *Hampton*, *supra* note 22, at 501 (listing litany of petty imperfections in vehicle maintenance or driving used as pretexts for searches (citing *United States v. Zapata-Ibarra*, 223 F.3d 281, 282-83 (5th Cir. 2000) (Wiener, J., dissenting))); Kenneth DeCock & Erin Mercer, Comment, *Balancing the Scales of Justice: How Will Vasquez v. State Affect Vehicle Searches Incident to Arrest in Wyoming?*, 1 WYO. L. REV. 139, 154-57 (2001) (listing several states interpreting their constitutions as providing greater automotive privacy than federal Fourth Amendment).

115. *United States v. Panitz*, 907 F.2d 1267, 1271-72 (1st Cir. 1990) (stating probable cause justifies search regardless of exigencies at automobile seizure or search (citing *Michigan v. Thomas*, 458 U.S. 259, 261 (1982) (permitting warrantless search of immobilized automobile))). The First Circuit also stated that such a search, if reasonable, “need not be conducted contemporaneously with the seizure” of the automobile. *Id.* at 1272.

116. *Commonwealth v. Nicholson*, 792 N.E.2d 124, 128 (Mass. App. Ct. 2003) (permitting police to search for and retrieve liquor bottles).

117. U.S. CONST. amend. V (providing no person “shall be compelled in any criminal case to be a witness against himself”); U.S. CONST. amend. XIV, § 1 (protecting from state abridgment federal privileges and immunities, due process, “equal protection of the laws”).

118. 402 U.S. 424 (1971).

119. *Id.* at 426 (Burger, C.J., plurality) (quoting CAL. VEH. CODE § 20002(a)(1) (West 2005)). The plurality exhorted that the Constitution provides no right to flee accidents to avoid possible legal involvement. *Id.* at 434 (Burger, C.J., plurality).

held that such disclosures do not create “substantial hazards of self-incrimination” because the statute was directed at the general public rather than a “highly selective group inherently suspect of criminal activities,” and was “essentially regulatory, not criminal,” noting that self-reporting was indispensable to its fulfillment.¹²⁰ The plurality then stated that, even if the statutory self-identification was self-incriminating, such information was not testimonial as required to invoke the Fifth Amendment because it merely provided “essentially neutral” information necessary for vehicle regulation.¹²¹

4. Early Precedent: The EDR Criminal Cases

a. A California Couplet

Criminal law implications of EDRs first arose in two unpublished California Court of Appeals cases involving vehicular manslaughter decided in 2003 and 2004.¹²² In both cases, the admissibility of EDR data appeared uncontested

120. *Byers*, 402 U.S. at 427-31 (Burger, C.J., plurality) (quoting *Albertson v. SACB*, 382 U.S. 70, 79 (1965)). The plurality, applying the “substantial hazards of self-incrimination” test, described automobile laws as comparable to income tax laws in applying to millions (“here all persons who drive automobiles”) and distinguishable from such suspect groups as Communists and gamblers. *Id.* at 430-31 (Burger, C.J., plurality) (adding “it is not a criminal offense . . . to be a driver ‘involved in an accident’”). Compare *United States v. Sullivan*, 274 U.S. 259, 263-64 (1927) (refusing to allow bootlegger to use self-incrimination as “conjurer’s circle around” entire tax return) with *Marchetti v. United States*, 390 U.S. 39, 46-48 (1968) (describing minefield of federal and state criminal statutes and government investigatory efforts against gambling) and *Albertson*, 382 U.S. at 79 (declaring communist review by government boards as “permeated with criminal statutes” and risks of self-incrimination). But see *Byers*, 402 U.S. at 461 (Black, J., dissenting) (fulminating group of all drivers “involved in accidents causing property damage” overwhelmingly suspect); *id.* at 469 (Brennan, J., dissenting) (lambasting “inherently suspect” group test as unsuited to self-incrimination privileged bankrupts, businessmen, policemen, and lawyers).

121. *Byers*, 402 U.S. at 431-34 (Burger, C.J., plurality) (noting identity may lead to inquiries producing arrest but such inquiries require different, independent evidence); see also *Schmerber v. California*, 384 U.S. 757, 763-64 (1966) (limiting self-incrimination privilege to “compulsion to extort communications”). The *Schmerber* Court further clarified that the Fifth Amendment “reaches an accused’s communications, whatever form they might take” and prohibits “compelling ‘communications’ or ‘testimony,’ but that compulsion which makes a suspect . . . the source of ‘real or physical evidence’ does not violate it.” *Schmerber*, 384 U.S. at 763-64. Applying this principle, the *Byers* Court concluded that, because the self-identification statute provides driver identity for “valid state needs” including “study of causes of vehicle accidents,” such disclosure was non-testimonial and merely “to implement the state police power to regulate use of motor vehicles.” *Byers*, 402 U.S. at 432-33 (Burger, C.J., plurality). But see *id.* at 462 (Black, J., dissenting) (insisting statute required disclosure only of information “greatly enhanc[ing] the probability of conviction for crime”). Justice Brennan argued that the only noncriminal state interest involved in a disclosure requirement was resolving private automobile accident tort litigation, and that such litigation was no different from any other civil suit. *Id.* at 476-77 (Brennan, J., dissenting). Justice Harlan retorted that the statute was “only a part of a comprehensive self-reporting scheme for all classes of automobile accidents causing harm to others” and exhorted that “significant interference with state regulatory goals unrelated to . . . criminal sanctions may mean that there is no Fifth Amendment privilege even though [the defendant sees] ‘real’ and not ‘imaginary’ risks of self-incrimination.” *Id.* at 451 n.6, n.7 (Harlan, J., concurring) (defending comprehensive accident reporting scheme); *id.* at 452 n.7 (Harlan, J., concurring) (defending limits on Fifth Amendment in regulatory context).

122. *People v. Knight*, F041906, 2004 Cal. App. Unpub. LEXIS 2982, at *1-*2 (Cal. Ct. App. Apr. 1, 2004) (noting conviction for vehicular manslaughter, driving under influence of drugs or alcohol, hit and run);

and, as to the probative value of the data, the court merely stated as a fact that the accident reconstruction experts had used information from the defendants' EDRs.¹²³ Neither case dealt with EDRs on appeal; one appeal did not concern accident reconstruction at all, and the accident reconstructionist issue on appeal in the other case concerned other, non-EDR, evidence of impact.¹²⁴

b. *People v. Christmann*

*People v. Christmann*¹²⁵ exposed the criminal law issues of EDRs, in the context of a prosecution for speeding resulting in the death of a pedestrian.¹²⁶ A state trooper (accident reconstructionist) arrived at the scene of the accident, directed that the defendant's vehicle not be moved, and downloaded the EDR data in the defendant's vehicle's SDM using a Vetronix CDR.¹²⁷ The reconstructionist then used the EDR data, in conjunction with impact and accelerometer information, to determine the speed of the defendant's vehicle at impact.¹²⁸ The court noted, however, that no testimony asserted that the EDR "could be calibrated in any way."¹²⁹

The defendant in *Christmann* challenged the warrantless downloading as an unconstitutional invasion of privacy.¹³⁰ The court held that the immediate warrantless downloading of SDM data did not violate the defendant's Fourth Amendment right to be free from unreasonable searches.¹³¹ The court reasoned that

People v. French, B156025, 2003 Cal. App. Unpub. LEXIS 3917, at *1 (Cal. Ct. App. Apr. 21, 2003) (noting conviction for vehicular manslaughter).

123. *Knight*, 2004 Cal. App. Unpub. LEXIS 2982, at *13 (noting accident reconstructionist used defendant's SDM to determine automobile speed); *French*, 2003 Cal. App. Unpub. LEXIS 3917, at *7-*8 (noting accident reconstructionist used defendant's SDM to determine airbag system functioned properly; comparing FDR).

124. *French*, 2003 Cal. App. Unpub. LEXIS 3917, at *41-*44 (concluding accident reconstructionist testimony not beyond scope of expertise). See generally *Knight*, 2004 Cal. App. Unpub. LEXIS 2982 (discussing no issues of accident reconstruction on appeal).

125. 776 N.Y.S.2d 437 (N.Y. J. Ct. 2004).

126. *Id.* at 438 (describing charge; noting pedestrian death).

127. *Id.* at 438-39 (noting download connection involved plugging CDR wire into SDM under dashboard); see also *supra* notes 49-54 and accompanying text (explaining SDM operation); *supra* notes 55-62 and accompanying text (explaining operation of CDR, precursors and alternatives).

128. *Christmann*, 776 N.Y.S.2d at 439 (noting reconstructionist does not base vehicle speed opinion on SDM data alone). The reconstructionist refused to equate successful data download with proof of data accuracy. *Id.*

129. *Id.* (contrasting lack of calibration testimony against calibration of radar and breathalyzer devices); see also *supra* notes 77-80 and accompanying text (discussing three-prong device test that arose under *Frye* and required expert testimony of device condition).

130. *People v. Christmann*, 776 N.Y.S.2d 437, 440 (N.Y. J. Ct. 2004) (noting statute requires officer to investigate fatal motor vehicle accidents' circumstances, contributing factors, and cause); see also *supra* Part II.C.2 (discussing Fourth Amendment, automobile exception, and variations).

131. *Christmann*, 776 N.Y.S.2d at 441-42 (concluding such download not violative of defendant's rights under New York Constitution either).

[there is] only a diminished expectation of privacy in the mechanical areas of the vehicle [which] must yield to the overwhelming state interest in investigating fatal accidents . . . In the area of automobile safety, there is a high degree of governmental regulation, and a search conducted to carry out this regulation has a low threshold of reasonableness. Since the testing done of the SDM records data regarding the performance of the vehicle during the incident such testing is a reasonable extension of [governmental regulation in the area of automobile safety]. The downloading of the information is not analogous to a container search, nor does it extend to the private areas of the vehicle. There is also no opportunity for a police officer to select only the desired data or to manipulate it

. . . .

. . . [Furthermore, in downloading SDM data, a] real exigency exists. Evidence regarding the pre-accident conditions within [d]efendant's automobile could easily be destroyed, either purposely or accidentally [sic], if the automobile was moved from the scene under its own power.¹³²

The *Christmann* court also addressed the defendant's claim that SDM evidence was inadmissible.¹³³ Rather than invoking the three-prong device test developed under many *Frye* jurisdictions, however, the court used a New York standard requiring merely that once "the data obtained from [proven, reliable scientific] systems is deemed reliable, such evidence is admissible without . . . expert testimony describing and endorsing the science involved."¹³⁴ The court cited *Bachman* to demonstrate that SDM data is "generally accepted as reliable and accurate by the automobile industry and the National Highway and Traffic Safety Administration" and therefore held that SDM data is admissible.¹³⁵

c. *People v. Hopkins*

People v. Hopkins, another New York trial court case, further examined both constitutional and evidentiary EDR issues in a prosecution for reckless driving, speeding, the resultant murder, and leaving the scene of the accident.¹³⁶ The police accident reconstructionist in *Hopkins*, in contrast to the State Trooper in *Christmann*, applied for and was granted a search warrant permitting seizure of

132. *Id.* at 441 (citing *South Dakota v. Opperman*, 428 U.S. 364 (1976)); *see also supra* notes 112-113 and accompanying text (discussing *Opperman*).

133. *Christmann*, 776 N.Y.S.2d at 440 (seeking to define required evidence foundation for admission of SDM data).

134. *Christmann*, 776 N.Y.S.2d at 442 (citing *People v. Magri*, 147 N.E.2d 728 (N.Y. 1958)).

135. *Id.* (quoting *Bachman v. Gen. Motors Corp.*, 776 N.E.2d 262 (Ill. App. Ct. 2002)); *see also supra* notes 87-91 and accompanying text (detailing *Bachman* court's holding and reasoning).

136. *People v. Hopkins*, 2004-0338, 2004 N.Y. Misc. LEXIS 2902, at *1 (N.Y. County Ct. Aug. 30, 2004) (describing charges).

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the defendant's EDR.¹³⁷ Although the search warrant inventory sheet misspelled "airbag module" as "air bad module," the warrant described the specific vehicle containing the EDR, described the crash, and noted that General Motors and Vetronix had personally trained the accident reconstructionist in use of EDR data.¹³⁸ The accident reconstructionist then used the EDR data to determine the speed of the defendant's vehicle at impact and over the preceding five seconds, as well as the time during which the brake was on.¹³⁹

The defendant in *Hopkins* challenged the warrant for the EDR data as both "issued on less than probable cause" and inadequate for EDR seizure due to the "air bad module" typographical mistake.¹⁴⁰ The court held that the descriptions of the crash, vehicle, and accident reconstructionist's training together demonstrated probable cause for the warrant.¹⁴¹ The court dismissed the misspelling of "bag" as "bad," declaring the error "inconsequential given the air bag [sic] module's specific identification by part number, service number and serial number."¹⁴²

The *Hopkins* court also addressed the defendant's claim that SDM evidence was inadmissible under the *Frye* test still applicable in New York.¹⁴³ The court stated that

reliability may be established in at least three ways: (1) 'general acceptance . . . so notorious that the court may take judicial notice of it' (2) . . . 'established by

137. *Id.* at *18-*19 (noting court issued EDR warrant after issuing prior warrant for other evidence at defendant's home).

138. *Id.* at *19, *27, *29 (noting "air bad module" typographical error, specific description of defendant's car, inclusion of EDR training background). The warrant sought the defendant's physical SDM black box for data on velocity change, to aid the crash analysis and reconstruction. *Id.* at *27 (noting warrant also sought multitudinous other serology and identification evidence).

139. *Id.* at *9 (noting brake switch on two to three seconds before impact). The EDR data was particularly incriminating because it demonstrated that the defendant drove faster than three times the posted speed limit until the moment of impact, when he slowed to double the posted speed limit. *Id.*

140. *Hopkins*, 2004-0338, 2004 N.Y. Misc. LEXIS 2902 at *18-*19 (noting defendant also alleged police returned warrant four days after ten-day statutory search deadline); *see also supra* note 111 and accompanying text (describing "probable cause" historically and in context of automobile exception analysis). The court noted that under the probable cause requirement, the warrant application must "support a reasonable belief that evidence of a crime may be found in a certain place" but need not provide proof beyond a reasonable doubt. *Hopkins*, 2004 N.Y. Misc. LEXIS 2902, at *19-*20 (quoting *People v. German*, 678 N.Y.S.2d 393, 395 (N.Y. App. Div. 1998)).

141. *Hopkins*, 2004 N.Y. Misc. LEXIS 2902, at *26-*30 (discussing justification for warrant). Specifically, the court concluded that the warrant supported the reasonable belief that "evidence of a crime could be found in the [car]." *Id.* at *29.

142. *People v. Hopkins*, 2004-0338, 2004 N.Y. Misc. LEXIS 2902, at *26 (N.Y. County Ct. Aug. 30, 2004) (concluding also four day delay in warrant return neither unreasonable, unnecessary, nor prejudicial to defendant).

143. *Id.* at *36 (noting defendant claimed SDM module not generally accepted as reliable in New York scientific community). Ironically, in a case that will undoubtedly be a significant addition to early EDR jurisprudence, the *Hopkins* defendant based his "not generally accepted as reliable" argument on "the absence of judicial precedent" regarding EDRs. *Id.*

reference to legal writings and judicial opinions' (3) [or] 'a hearing at which the proponent may establish admissibility by offering evidence of acceptance, including the expert's own testimony.'¹⁴⁴

Applying the second method, the court cited *Christmann*, *Bachman*, and NHTSA literature, among other sources, to demonstrate that "the SDM module technology has been generally accepted as reliable in the relevant scientific community."¹⁴⁵ The court impliedly accepted the prosecution's assertion that "concerns regarding the SDM data limitations raise foundational issues regarding the specific reliability of the procedures used to generate data, all of which go to the weight of the evidence rather than its admissibility."¹⁴⁶

III. ANALYSIS: MAKING THE BLACK BOX TALK IN CRIMINAL CASES

A. Admissibility Issues

1. Ownership

Ownership of an EDR can reside with the owner of the automobile containing it only if the sale of the automobile also results in a sale of the EDR, or if the EDR becomes the property of the automobile owner at some point after purchasing the automobile.¹⁴⁷ EDRs are a functional component of the automobiles in which they are installed and are inoperative without the automobile.¹⁴⁸ Therefore, aside from as-yet untested attempts to contractually segregate ownership of the EDR from ownership of the automobile, courts will probably hold that automobile owners also own the installed EDRs.¹⁴⁹

Even if some EDR manufacturers design their EDRs to require manufacturer assistance to access the data, and even if some automobile manufacturers leave consumers in the dark about the black box, the EDR remains a functioning component of the automobile.¹⁵⁰ Although EDRs are owned by the owners of the automobiles, EDR ownership should be indistinguishable from ownership of the automobile itself.¹⁵¹ Courts and legislatures should resolve constitutional

144. *Id.* at *40-*41 (quoting PRINCE, RICHARDSON ON EVIDENCE § 7-311 (11th ed.)).

145. *Id.* at *37-*41 (concluding no *Frye* hearing necessary to determine admissibility of SDM evidence).

146. *Hopkins*, 2004 N.Y. Misc. LEXIS, at *38-*39 (stating foundation concerns adequacy of specific procedures used for specific evidence (citing *People v. Wesley*, 633 N.E.2d 451, 452-54 (N.Y. 1994))).

147. *See supra* note 107 and accompanying text (noting NHTSA characterization of automobile sale as fee simple transfer of property rights in EDR).

148. *See supra* note 58 and accompanying text (noting some EDRs require car electrical power to function).

149. *See supra* note 107 (noting NHTSA argument that automobile owners also own EDR data).

150. *See supra* note 108 and accompanying text (noting European EDR manufacturer access limitations and automobile manufacturer policies favoring disclosure of EDRs).

151. *See supra* note 107 and accompanying text (citing arguments for refusal to distinguish sale of

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and other issues with the understanding that the EDR is a component of the car no less than is a tire or exhaust pipe; this should allay fears of uncooperative automobile owners flaunting their ownership of the EDR before police desperate to resolve an accident.¹⁵²

2. *The Fourth Amendment*

a. *With a Search Warrant*

Officers retrieving an EDR unit or downloading EDR data can avoid Fourth Amendment issues entirely by first obtaining a valid warrant.¹⁵³ If officers write warrant applications that specify serial number, part number, manufacturer, model, and vehicle identification number (VIN) for the cars and EDRs searched, they can ensure that any reasonable court will overlook innocuous typographical errors like the “air bad” mistake in *Hopkins* as inconsequential.¹⁵⁴ If the officers involved had training in both manual EDR box retrieval and laptop CDR data retrieval, a search of EDR data would stand a very high chance of producing a wealth of information, depending on the EDR model, about the driving of the vehicle immediately prior to the accident.¹⁵⁵ In an accident investigation involving death, injury, property damage, or traffic infractions, probable cause for a warrant will practically be an afterthought because the likelihood of finding some EDR evidence of a crime—whether data on speeding, angle of impact, inadequate braking, or inadequate use of restraints—is overwhelming.¹⁵⁶ A careful officer, however, should bolster his warrant application even more by including descriptions of the accident by himself and available witnesses.¹⁵⁷

automobile from sale of EDR).

152. See *supra* note 107 (noting concerns of owners unjustifiably withholding EDR data).

153. See *supra* note 137 and accompanying text (discussing *Hopkins* accident reconstructionist’s application for warrant prior to retrieval of SDM black box).

154. See *supra* note 138 and accompanying text (discussing specificity of *Hopkins* warrant applications and willingness of court to overlook inconsequential errors); *supra* note 142 and accompanying text (noting *Hopkins* court held typographical error inconsequential, given numerous other vehicle and EDR details).

155. See *supra* notes 52-54 and accompanying text (describing wealth of parameters recorded by various EDR models); *supra* note 138 and accompanying text (noting *Hopkins* warrant application included specific EDR training background of investigating officer).

156. See *supra* notes 52-54 and accompanying text (describing potential impact of EDR data on accident reconstruction); *supra* note 123 and accompanying text (describing use of EDR data in *Knight* and *French* accident reconstructions); *supra* note 128 and accompanying text (describing use of EDR data in *Christmann* to determine speed at impact); *supra* note 139 and accompanying text (describing use of EDR data in *Hopkins* to determine braking and speed preceding impact); *supra* note 141 and accompanying text (noting descriptions of vehicle, EDR, and training in warrant application fortified *Hopkins* probable cause finding).

157. See *supra* note 138 and accompanying text (noting *Hopkins* officer included crash descriptions); *supra* note 141 and accompanying text (noting support of crash descriptions in court’s probable cause finding).

b. Without a Search Warrant: The Automobile Exception

When officers fail to obtain a warrant before retrieving either an EDR black box or CDR-downloaded data, the prosecution should insist that the warrantless search—assuming that the term “search” applies at all—was nonetheless constitutional under the automobile exception.¹⁵⁸ The two principles supporting the constitutionality of warrantless EDR retrievals, as the *Christmann* court articulated, are that EDR searches do not penetrate private areas of the vehicle and that officers retrieving EDRs or data therefrom have no opportunity to discriminate or manipulate the data.¹⁵⁹ One can reach the same constitutional conclusion by driving these principles down any of three roads: a pure *Carroll* analysis, an enhanced *Opperman* analysis, or an alternative container search analysis.¹⁶⁰ Despite the trend of courts to require no exigencies for automobile exception searches, the likely presence of genuine exigencies at either roadside or impoundment lot should further convince courts to vindicate EDR searches.¹⁶¹

i. Automobile Exception Under Carroll

Under the original *Carroll* automobile exception, an officer’s knowledge that a car contains an EDR, combined with observation or reports of the accident, add up to circumstances sufficient to justify the officer believing that the car—i.e., the vessel to which the EDR is attached—contains evidence of a crime, creating probable cause that excuses the absence of a warrant.¹⁶² The misdemeanor or felony classification of the crime on which anticipated evidence would bear is irrelevant, anachronistic, and long since rebuked by the *Carroll* Court; a speed limit infraction gives rise to probable cause no less than does a motor vehicle homicide.¹⁶³ EDRs are as “visibly connected as elements of proof” to any driving offense as are bottles of liquor to operating under the influence, further bolstering probable cause under the holding of the Appeals Court of Massachusetts.¹⁶⁴ The fundamental policy behind the automobile exception, proscribing the driver’s use of the automobile as an instrumentality of the crime, creates a unique link between bootleggers using automobiles as

158. See *supra* note 113 (noting *Harris* Court excluded regulation-mandated inventory from Fourth Amendment “search” category altogether).

159. See *supra* note 132 (discussing *Christmann* holding and reasoning).

160. See *infra* Part III.A.2.b.i (analyzing EDR searches under *Carroll*); *infra* Part III.A.2.b.ii (analyzing EDR searches under *Opperman* and subsequent cases); *infra* Part III.A.2.b.iii (analyzing EDR searches as container searches).

161. See *infra* Part III.A.2.b.iv (analyzing exigency issues involved in EDR searches).

162. See *supra* notes 110-111 and accompanying text (discussing probable cause for automobile exception searches; noting *Emery* “probable cause” definition).

163. See *supra* note 111 (contrasting antiquated nineteenth-century *Carey* distinction between misdemeanor and felony against explicit *Carroll* rebuke).

164. See *supra* note 116 and accompanying text (discussing Appeals Court of Massachusetts holding in *Nicholson*).

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conveyances for moonshine in the 1920s and offending drivers using automobiles as weapons of endangerment, injury, or homicide today.¹⁶⁵ Although both contraband and liquor bottles bear only on the fact of automobile use in crime rather than on the manner of that use, EDR data bears directly on both the fact of use and the manner in which the driver used the automobile as an instrumentality of the crime.¹⁶⁶

ii. Automobile Exception Under Opperman

Opperman should allow EDR searches even without the probable cause required for a *Carroll* search.¹⁶⁷ EDR searches in accidents are a component of inventories conducted pursuant to standard police procedure; police customarily examine the bodies of automobiles at the scene of an accident or at the impoundment lot shortly thereafter.¹⁶⁸ Retrieval of the EDR black box and downloading of EDR data via a CDR, like standard searches of automobile bodies, culls information concerning the movement and physical conditions of the vehicles prior to the accident.¹⁶⁹ Analysis of EDR data on velocity, braking, turns, and restraints, like searching the accident scene for automobile positions, mechanical status of automobiles, and site topography, reconstructs the conditions during the accident.¹⁷⁰

Ideally, either state legislatures or state and local law enforcement agencies will issue standard regulations for use of EDRs by police accident investigators, akin to the civil regulations currently in place for other transportation industry data recorders.¹⁷¹ Such regulations would further substantiate the “standard police procedures” aspect of EDR searches under *Opperman*.¹⁷² Even a court that held “standard police procedures” reasoning inapplicable to EDR searches, however, would likely allow the searches as “routine administrative caretaking functions.”¹⁷³ Accident scenes often lack sufficient clarity for officers to begin assigning criminal liability; in the rush to provide adequate medical attention, deal with the accident as a road hazard, and create records for insurance and civil liability purposes, the responding officers may never deal with criminal

165. See *supra* note 111 (noting centrality of automobile as instrumentality of crime).

166. See *supra* notes 110-111 and accompanying text (discussing *Carroll*); *supra* note 116 and accompanying text (discussing *Nicholson*).

167. See *supra* notes 112-113 and accompanying text (discussing *Opperman* and related cases).

168. See *supra* notes 112-113 and accompanying text (noting *Opperman* emphasized “standard police procedures”).

169. See *supra* notes 123, 128, 139, and accompanying text (describing analysis of EDR data by accident reconstructionists in *Knight*, *French*, *Christmann*, and *Hopkins*).

170. See *supra* notes 52-54 and accompanying text (discussing parameters stored by EDRs).

171. See *supra* Part II.A.1.a (discussing history of various non-automotive black boxes and accompanying regulations).

172. See *supra* notes 112-113 and accompanying text (noting *Opperman* language).

173. See *supra* note 113 (discussing *Cady* sanction of caretaking absent criminal liability questions and “totally divorced from” criminal investigations).

liability.¹⁷⁴ EDR data, however, is an indispensable aid in each of those local, community caretaking functions.¹⁷⁵ For an impounded car, CDR data retrieval, like the discovery of marijuana in a routine inventory, is a mere inventory of automobile (data) contents; similarly, EDR black box retrieval is a mere inventory of automobile contents—contents fully returnable but prone to be reset if not safeguarded.¹⁷⁶

While the diminished expectation of privacy underlying *Opperman* applies to EDRs purely by virtue of the external location of EDRs on automobiles, the *Christmann* court correctly emphasized that the historical intimacy of law enforcement in dealing with automobile safety further diminishes privacy.¹⁷⁷ Automobiles remain as inherently mobile today as they were in 1976 when *Opperman* was decided, and this quality has sustained the “obviously public nature of automobile travel.”¹⁷⁸ The need of law enforcement and other government agencies concerned with traffic safety for all available information and statistics in ensuring driver safety and competence on public roadways has never been greater.¹⁷⁹ A state that can require annual inspection of brakes, tires, and emissions when no emergency exists creates an expectation that an emergency such as a highway accident would demand at least examination of the automobile information most relevant to the accident—EDR data, which is recorded and made accessible for the very purpose of accident investigation.¹⁸⁰

The heavy policy favoring public safety is fulfilled by retrieval of EDRs from impounded automobiles.¹⁸¹ Like a firearm left in an impounded automobile, EDRs are also removed for public safety, in order to ensure preservation of EDR data as evidence for pending civil actions and related accident investigation.¹⁸² As with removal of a registration card during an inspection, EDR black box retrieval—and certainly CDR data retrieval,

174. See *supra* note 113 (noting *Cady* contrasted local police officers heavily involved in non-criminal investigations with federal officers).

175. See *supra* Part II.A.2 (discussing uses of EDR data by government to improve restraint systems, highway safety, civil litigation); *supra* Part II.B.1 (illustrating use of EDR data in civil litigation following accidents).

176. See *supra* note 57 and accompanying text (noting methods, and resultant danger, of accidental EDR erasure); *supra* note 113 and accompanying text (noting *Opperman* marijuana seized while automobile impounded for parking violations); *infra* Part III.A.2.b.iv (analyzing EDR search exigency issues).

177. See *supra* notes 112-113 and accompanying text (discussing original *Opperman* articulation and justification of diminished expectation of privacy); *supra* note 132 and accompanying text (discussing *Christmann* application of *Opperman* policy to EDRs).

178. See *supra* note 113 and accompanying text (discussing public qualities of automobile travel).

179. See *supra* Part II.A.2 (discussing government agency goals for use of EDR data in improving highway safety).

180. See *supra* Part II.A.1.a (describing emergence of data recorders for purpose of improving safety in transportation industries); *supra* note 113 (noting *Opperman* Court described pervasive government regulations of automobiles, including inspections, licensing, stops, inventorying after impoundment).

181. See *supra* note 132 and accompanying text (emphasizing government regulation of automobile safety).

182. See *supra* note 113 (noting admission of firearm retrieved from impounded car in *Cady*).

involving no removal of any items in the automobile—is to “protect the car while . . . in police custody” from loss of the EDR data, removing the retrieval from classification as a Fourth Amendment “search” altogether.¹⁸³ The *Christmann* court’s exhortation that the diminished expectation of privacy in “mechanical areas of the vehicle” must surrender to an “overwhelming state interest” in accident investigation and improving highway safety articulates the full force of both law and policy behind the Automobile Exception.¹⁸⁴

iii. Container Search

Alternatively, a prosecutor could justify warrantless retrieval of an EDR black box or CDR data as a constitutional container search, despite the contrary language in *Christmann*.¹⁸⁵ Following the Sixth Circuit’s holding in *California v. Acevedo*, even minor driving offenses give rise to probable cause to search for evidence in containers located throughout the car.¹⁸⁶ Although the passenger compartment container search authorization, which accompanies arrest, would probably not apply to an EDR generally inaccessible to anyone inside of the automobile, the policies behind container searches nonetheless support searches for EDRs.¹⁸⁷

In light of the policies favoring searches without regard for compartment barriers, seizure of EDRs not confined by compartment barriers should stand unopposed.¹⁸⁸ Container search policies strongly support access to EDRs because EDRs are not physically located in areas commonly accessible to drivers.¹⁸⁹ An appropriate analogy, rather than opening a box found in the trunk or tearing open a package left on the floor of the front passenger seat, is instead unzipping a pouch found duct-taped to the exhaust pipe or unscrewing the lid of a jar found wedged in a corner of the hood.¹⁹⁰

Given the diminished expectation of privacy within automobiles generally, there is arguably an even lower expectation of privacy, if any, in areas of automobiles into which most drivers never delve and that would make for truly peculiar storage areas.¹⁹¹ Even states that defend automobile privacy more

183. See *supra* note 57 and accompanying text (noting dangers of accidental EDR erasure); *supra* note 113 (noting refusal of *Harris* Court to classify protective custodial inventory as Fourth Amendment “search”).

184. *Supra* note 132 and accompanying text (emphasizing *Christmann* holding).

185. See *supra* note 114 and accompanying text (discussing constitutionality of container searches). But see *supra* note 132 and accompanying text (noting *Christmann* court asserted CDR downloading not analogous to container searches).

186. See *supra* note 114 and accompanying text (referring to *Acevedo* and probable cause finding for failure to signal lane change in *Akram*).

187. See *supra* note 114 and accompanying text (discussing *Belton* “passenger compartment” searches).

188. See *supra* note 114 (noting *Ross* demand for compartments to surrender to needs of searches).

189. See *supra* note 55 and accompanying text (locating DLC connection under dashboard and SDM under front seat or center console).

190. See *supra* note 114 (offering less-fitting analogies).

191. See *supra* note 113 (noting *Opperman* diminished expectation of privacy).

vigorously than federal courts should concede that privacy is practically nonexistent in the areas of automobiles containing EDRs.¹⁹² EDRs and their data, in contrast to small bags of marijuana, are a functional component of the automobile rather than distinct personal property of the driver.¹⁹³ Even if a court disagreed with the characterization of EDR data as not being property of the automobile owner, there is nonetheless no plausible distinction between other external components commonly inspected by police—e.g., tires, physical brakes, steering column, and automobile body—and EDRs.¹⁹⁴

iv. Impounded Automobiles and Exigencies

Under the prevailing trend of courts to not require exigencies to justify warrantless automobile searches, courts and prosecutors need not distinguish roadside EDR retrievals from impounded-automobile EDR retrievals.¹⁹⁵ Even if a court demands exigencies, however, EDRs carry exigencies sufficient to satisfy the demands of any reasonable court.¹⁹⁶ The roadside exigency is danger of the driver driving away and potentially destroying—intentionally or unintentionally—the EDR data.¹⁹⁷ The impounded-automobile exigencies are dangers of both theft of the automobile and destruction of either the automobile or the EDR.¹⁹⁸

3. The Fifth Amendment

Courts should hold the Fifth Amendment completely inapplicable to EDRs because EDRs are “real” or “physical” evidence rather than “testimonial.”¹⁹⁹ As components of automobiles, EDRs record data independently of any act by the driver, save for turning the key; EDRs are therefore free of any “compulsion to extort communications,” let alone any “communications” in the first instance.²⁰⁰ Even if an officer demanded that a driver permit the officer to download the automobile’s EDR data, that data came into existence long before

192. See *supra* note 114 (noting some states root stronger automobile privacy in state constitutions).

193. See *supra* notes 112-113 (noting seizure of marijuana in *Opperman*).

194. See *supra* note 114 (listing several challenged but upheld constitutional container searches, none involving functional components of automobiles searched).

195. See *supra* note 115 and accompanying text (discussing current trend).

196. See *supra* note 132 and accompanying text (noting *Christmann* court’s overwhelming concern of EDR data destruction as “a real exigency”).

197. See *supra* note 132 and accompanying text (noting *Christmann* court’s concern about roadside exigencies).

198. See *supra* note 132 and accompanying text (noting *Christmann* court’s concern about impounded-automobile exigencies).

199. See *supra* note 121 and accompanying text (noting *Schmerber* distinguished self-incriminating testimonial communications from “real” or “physical” evidence).

200. See *supra* notes 49-51 and accompanying text (describing automatic EDR processes of recording, loop-breaking, and data freezing); *supra* note 121 (noting *Schmerber* Court emphasized Fifth Amendment prohibits “compelling” of “communications” or “testimony”).

and completely independently of the officer's demands.²⁰¹

Even if a court held that EDRs are testimonial or a form of "communications," the same policies that exempted the driver self-identification statute in *Byers* from the Fifth Amendment also apply to EDRs.²⁰² The group of "all persons who drive automobiles," applicable to EDR readings, is the same group of millions subjected to the identification statute; an even more narrow group of "all persons who drive automobiles that contain EDRs" encompasses millions of drivers.²⁰³ Neither is a highly or inherently suspect group and the government agencies concerned with EDRs are highway safety organizations that, unlike communist review boards or gambling investigation agencies, deal with civil issues, insurance questions, and hardly any criminal law matters.²⁰⁴ Like the taxpayer who could not draw a "conjurer's circle" around filing a tax return by virtue of being a bootlegger, a driver should not be able to draw a "conjurer's circle" around reconstruction of accidents in which he was involved—a vital part of determining insurance contracts and tort damages having nothing to do with criminal law—by virtue of having a vital collection of accident data stored in his automobile.²⁰⁵ The need for government agencies to have all available data at their disposal to improve highway safety and save lives demands that EDRs be available, rather than allowing a privilege for EDRs to significantly interfere—by removing a witness who will always be available to testify in civil cases or at highway safety commission hearings—with state accident regulations "unrelated to . . . criminal sanctions."²⁰⁶

4. Evidentiary Standards

a. Frye

EDR technology meets both the "general acceptance" rule in *Frye* and the three-prong device test that subsequently arose under it.²⁰⁷ Transportation data recorder technology has been in use since the 1950s and has permeated every major transportation industry; it is so omnipresent that the government has

201. See *supra* note 50 and accompanying text (noting freezing of data for later retrieval); *supra* note 121 (noting *Schmerber* emphasis on "compulsion to extort communications").

202. See *supra* notes 120-121 and accompanying text (contrasting opinions of *Byers* Justices).

203. See *supra* note 120 and accompanying text (discussing *Byers* plurality characterization of self-identification statute as applicable to "millions").

204. See *supra* note 120 and accompanying text (offering examples from *Albertson* and *Marchetti* of "inherently suspect groups").

205. See *supra* note 120 (comparing *Sullivan* taxpayer's attempt to dodge tax return filing); *supra* note 121 and accompanying text (describing *Byers* driver information as "essentially neutral").

206. See *supra* note 121 and accompanying text (noting Justice Harlan's insistence for Fifth Amendment to surrender when weighed against state regulatory goals).

207. See *supra* notes 71-72 and accompanying text (stating *Frye* "general acceptance in the particular field" test); *supra* notes 77-80 and accompanying text (describing three-prong device test).

regulated the precise data parameters recorded.²⁰⁸ Automotive data recorders have been used since the 1970s and the downloading technology available today is such an easy-to-use presentation of raw data that it has been held unnecessary to prove its qualifications as a basis for expert opinion testimony.²⁰⁹ The freezing of EDR data upon a cycle-termination event ensures that, until a reset of the EDR occurs (if ever), the data will be stored reliably and accurately.²¹⁰ As noted by the *Bachman* court, the forge of automobile industry competition tests methods of recording data by pitting manufacturers against one another in a race for the most reliable EDR—a most rigorous “peer review.”²¹¹ The *Hopkins* court appropriately concluded that EDRs are “generally accepted as reliable” and therefore satisfy the general *Frye* test.²¹²

The *Hopkins* court also demonstrated the new readiness of courts to view EDRs as so common that their reliability may be established by cases and secondary sources.²¹³ The relatively new and novel use of EDRs in case law within only the last fifteen years may justify the unwillingness of courts to recognize EDR reliability by outright judicial notice.²¹⁴ Within the next ten years, courts will probably begin to take judicial notice of EDR reliability as the technology becomes as well-known as other devices, like radar guns.²¹⁵

Under the three-prong device test, the *Bachman-Christmann-Hopkins* tradition should suffice to demonstrate the accepted scientific principles behind EDRs.²¹⁶ Prosecutors may prove accurate construction of the device by resort to literature provided by the automobile manufacturer or, if applicable, the downloading device manufacturer.²¹⁷ Qualifications of the officer downloading the data must also be proven by fact arguments, and the *Hopkins* warrant application provides an excellent example of early action taken to prove officer training.²¹⁸

208. *Supra* Part II.A.1.a (detailing history of transportation data recorders across sea, rail, marine, and commercial trucking industries).

209. *Supra* notes 92-94 and accompanying text (describing *Brill-Edwards* exemption of EDRs from scientific testimony altogether); *see also supra* note 89 and accompanying text (noting *Bachman* observation crash sensors used for over ten years).

210. *See supra* note 90 and accompanying text (noting *Bachman* observation loss of electricity does not affect reliability or accuracy of recorded data); *supra* note 57 and accompanying text (describing conditions necessary to erase EDR recording).

211. *Supra* note 90 and accompanying text (noting *Bachman* observation of industry peer review); *see also supra* note 55 (listing various EDR technologies, models, and manufacturers).

212. *Supra* note 145 and accompanying text (noting *Hopkins* conclusion and holding).

213. *Supra* note 145 and accompanying text (describing determination of *Frye* qualifications without full hearing but by resorting to cases and literature).

214. *See supra* note 78 and accompanying text (noting potential for proving device’s underlying scientific principles by judicial notice “if notorious”).

215. *See supra* note 78 (describing early court approaches to radar devices).

216. *See supra* note 77 and accompanying text (describing requirements under three-prong test).

217. *See supra* notes 77-80 and accompanying text (noting predominance of factual disputes concerning device condition and user qualifications).

218. *See supra* notes 77-80 and accompanying text (noting most disputes over devices focus on fact

b. Daubert

Applying the holding of the Northern District of Texas, EDR data should be admissible as part of accident reconstructionist expert testimony under *Daubert*.²¹⁹ Prosecutors can establish the scientific or technical basis for EDR data by using technical documents from automobile manufacturers, downloading device manufacturers, and government agencies, such as the NHTSA.²²⁰ The uniformity with which courts have accepted EDRs under *Daubert* in civil litigation will only further support such a finding.²²¹ That EDR data will aid a factfinder, given the mass of data stored depending on the EDR model, is practically an afterthought.²²²

B. Probative Value

The probative value of EDR data as evidence determines the benefits offered by EDRs in criminal cases.²²³ As EDR technology becomes more reliable, doubts as to the consistency of EDR technology will likely diminish, as reflected by the ease with which both the *Christmann* and *Hopkins* courts made the initial decisions in favor of admission.²²⁴ Furthermore, the *Librado* court appeared to take for granted the probative value of the evidence.²²⁵ The NHTSA projects that EDR data will include dozens of additional parameters in coming years, and “pre-crash data” such as steering wheel angle, brake use, and vehicle speed are all crucial in establishing the facts of driving offenses.²²⁶ The means of retrieving data from EDRs are available to law enforcement, making EDR data a highly accessible tool in conducting accident investigations.²²⁷ The

questions of device condition and user qualifications); *supra* note 138 and accompanying text (describing specificity of *Hopkins* search warrant application).

219. See *supra* notes 73-74 and accompanying text (stating two-prong *Daubert* test of scientific knowledge that assists trier of fact); *supra* notes 82-85 and accompanying text (describing *Librado* court holding EDRs admissible under *Daubert*).

220. See *supra* Part II.A.2.b (describing technical and historical background of EDRs); *supra* notes 207-212 and accompanying text (offering arguments for scientific-technical underpinnings of EDRs).

221. See *supra* Part II.B.1 (chronicling factual background of EDR uses in civil litigation); *supra* note 81 and accompanying text (discussing consistent *Daubert* holdings in favor of civil admissibility).

222. See *supra* notes 52-54 and accompanying text (describing data stored in various EDRs).

223. See *supra* Part II.B.3 (describing early judicial skepticism toward EDRs).

224. Compare *supra* notes Part II.B.3 (describing early judicial skepticism toward EDRs) with *supra* note 123 and accompanying text (noting unchallenged use of EDR data in *Knight* and *French* accident reconstructions) and *supra* note 135 and accompanying text (describing haste of *Christmann* court’s endorsement of EDRs, albeit while conducting admissibility analysis) and *supra* note 146 and accompanying text (describing refusal of *Hopkins* court to preempt factfinder probative value decision).

225. *Supra* notes 82-85 and accompanying text (discussing *Librado* court’s vigorous endorsement of EDRs).

226. NAT’L HIGHWAY TRAFFIC SAFETY ADMIN. EVENT DATA RECORDER (EDR) WORKING GROUP, *supra* note 25, at 40 (listing acceleration, direction, location, seatbelts, occupants, time of crash, rollover, yaw, braking, stability, airbags).

227. *Id.* at 46-47 (noting NHTSA provides grant money to law enforcement agencies to fund purchase of Vetronix CDRs).

probative value that factfinders can derive from EDR data as interpreted by accident reconstructionists is dwarfed only by the absence of live witnesses in many accident cases.²²⁸

IV. CONCLUSION

While the concerns of privacy advocates are understandable, it would be wrong to cripple the American policeman or state trooper, both of whom need EDR data in order to effectively maintain safe roads and investigate accidents. EDRs are essential in ensuring that true justice is meted out to the most callous drinkers who think nothing of downing a few dozen shots of vodka before cruising down the highway. In time, the sure knowledge of a driver that his recklessness will be documented and can be proven will have a deterrent effect by causing individuals to make safe choices—albeit out of the selfish motive of avoiding conviction—rather than placing the lives of innocent motorists at risk.

The owner of the automobile is the owner of the EDR, but that should not allow him to prevent retrieval of the EDR when a search limited to the automobile body would be constitutional. Police do not violate the Fourth Amendment by retrieving an EDR or its data from an automobile, regardless of whether the automobile is parked by the side of a highway or sitting in an impoundment lot. For an officer faced with a drunk driver, a wreck, and a comatose victim, the probable cause that an EDR will turn up evidence of some offense is overwhelming. A diminished expectation of privacy in automobiles, made microscopic in the case of EDRs, when paired with dangers of accidental or intentional erasure of EDR data, further supports the permissibility of EDR retrieval under the automobile exception. Permissible container searches in automobiles provide additional support in favor of finding EDR retrievals constitutional.

Self-incrimination is not a weapon that a highway menace can use to prevent police from learning how his accident occurred. The Fifth Amendment does not apply to EDRs, because they contain real, physical evidence, rather than testamentary communications produced in response to an officer's demands. EDRs also share several characteristics with permissible self-identification statutes, in that both EDR data and driver self-identification apply to millions of drivers who, as a group, are not inherently suspect.

Under any applicable evidentiary standard, EDRs are admissible. EDRs satisfy *Frye* by the long industry competition that has produced and continues to refine EDRs, as well as the history of transportation data recorder use in accident investigations and civil litigation over more than fifty years. EDRs

228. *Id.* at 57-58 (noting usefulness of EDRs in accident cases). The NHTSA has stated that “[law enforcement] users would benefit greatly from obtaining quick and impartial information regarding the crash. They are often charged with determining the facts associated with a crash, and these data would give them additional tools to validate field collision data, determine crash causation, and fraud.” *Id.*

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fulfill *Daubert* through the same strong reliability, as well as the consistent recording of EDR data and the simplicity of data downloading. The spread of Vetronix CDR technology may soon render evidentiary tests a non-issue for admitting data.

EDRs will be of high probative value to factfinders in the coming years. Although early models relied on a great deal of technical explanation to make the data connect to the facts, the graphical displays of newer models and the ease with which officers use them will allow courts and juries to immediately understand what the technology says about the case at-bar. When that happens, EDRs will prove the key to closing the door on a litany of motor vehicle offenses.²²⁹

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