IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF NEW YORK

Matthew Avitabile,

vs. Case No. 16-CV-1447 DNH/CFH

Lt. Col. George Beach, in his official capacity as
Superintendent of the New York State Police.

DECLARATION OF MICHAEL BRAVE

I, Michael Brave, being of legal age and under the penalties of perjury, state as follows:

1. I am a competent adult and have personal knowledge of the following facts, or believe them to be true based on information and belief. Facts about which I do not have personal knowledge are of the type reasonably relied upon by experts in this field and have probative value to me in rendering my opinions.

2. Attached hereto is a true and accurate copy of my expert report in this litigation.

3. The report summarizes my analysis and findings and includes a statement of my opinions. The report also includes data and other information considered by me in forming my opinions and sets out my qualifications (including my resume).

4. My opinions are expressed to a reasonable, or higher, degree of professional certainty.

5. I affirm under the penalties of perjury that the foregoing statements are true and correct.

Date: March 29, 2018

Michael Brave, Member/Manager
LAAW International, LLC

Brief Partial Select Summary of Case Specific Opinions

1. Virtually anything, including civilian and law enforcement force options, can cause or contribute to death, including a pencil, shoe, water, etc.

2. Virtually anything can be unlawfully or mis-used as a force option or weapon.

3. To date Axon Enterprise, Inc. (Axon), formerly (as of 5 April 2017) TASER International, Inc. (TASER) has sold over 300,000 civilian version Conducted Electrical Weapons (CEWs) to civilians, and over 1,000,000 CEWs for law enforcement. Over 6,000,000 people have been exposed to TASER CEWs in field use and volunteers.

4. In most United States (U.S.) states, TASER CEWs are lawful for adult civilians to own, possess, and use.

5. There are no known cases of fatality or serious injury from a lawful civilian use of a TASER® CEW in the peer-reviewed literature.

6. Some CEWs can cause or induce involuntary motor-nerve mediated muscle contractions that can result in neuro-muscular incapacitation (NMI).

7. CEWs are generally considered to be a non-deadly, less than deadly, non-lethal, less-lethal, less-than-lethal force option.

8. Chemical aerosols generally require significantly more time to have effect than CEWs.

9. Chemical aerosols generally have a much longer post-exposure effects period than CEWs.

10. Chemical aerosols have a much higher risk of inadvertent exposure to non-targets than CEWs.

11. Chemical aerosols generally require significantly greater decontamination efforts than CEWs.

12. CEWs are more effective in non-use (e.g. intimidation compliance) than other force options.

13. Electroshock weapons (ESWs), including CEWs are handheld battery-operated devices designed to be effective while delivering a low current under challenging field-use circumstances.

14. In field use, CEWs are deployed under a virtually endless myriad of circumstances. Factors including, but not limited to, officer factors, subject factors, incident circumstances, distance to target, rapidly evolving nature of the incident, various clothing parameters, weather and environmental conditions, different subject body types and degrees of musculature, varying degrees of past or current substance influences, and many other factors can foreseeably play a role in the deployment and effectiveness of a CEW under these often difficult, stressful, and rapidly evolving circumstances.

15. The deployment and use of TASER CEWs has been shown to reduce injuries to officers and subjects over other force options.

16. The deployment and use of TASER CEWs has been shown to reduce officers' workers' compensation claims for use-of-force and arrest-related injuries.

17. The deployment and use of TASER CEWs has been shown to reduce use-of-force citizen complaints and law enforcement internal affairs complaints against law enforcement officers.

18. The deployment and use of TASER CEWs has resulted in the reduced need to use deadly force.

19. Rates of injury from TASER CEWs is comparable to, or less than, some collegiate contact and exertional sports.

20. Rates of injury from TASER CEWs is less than several other common law enforcement force options, including, but not limited to: impact projectiles, batons, impact tools, canines, rubber bullets, and others.

21. The deployment and use of TASER CEWs has been found to be a lower risk than most personal force options, including, but not limited to: batons, chemical spray, and pepper spray.

22. TASER CEWs are a safer alternative than other comparable law enforcement and civilian force options, tools, or techniques.

23. TASER CEWs are shown to reduce subject injuries when compared to physical force options.

24. TASER CEWs have greater accountability features than any other force option.

25. TASER CEWs are the most studied force option available to United States (U.S.) law enforcement.

26. TASER CEWs are the most effective force option in accomplishing intended effects for U.S. law enforcement.

27. According to peer-reviewed literature, the TASER CEW causes less-severe physiologic and metabolic effects that most other force options.

28. According to peer-reviewed literature, the TASER CEW is the safest force option available to law enforcement.

29. Other opinions and explanations are found throughout this document, attachments, appendices, references, and foundational sources, hereby fully incorporated herein.

Statements - Facts/Opinions: (NY) Avitabile v. Beach

Introductory Statements

Not Legal Advice or the Practice of Law - The expert services rendered in this case and this document are not legal advice, and are not to be construed, in any way, as the practice of law. The expert report is developed by a law enforcement expert.

Report Focus – This report is focused solely on the incident captioned and related concerns and/or issues.

This Case Specific Limitation - Any actions, statements, writings, this report, information, any testimony, etc. are specifically limited to this case.

Expert Capacity - This report and any subsequent reports, testimony, opinions, etc. are within my capacity under LAAW International, LLC ("LAAW"), an Arizona LLC.

Right to Amend - The opinions in this report are living opinions. That is, should additional discovery material be received, and/or additional research be completed, and then reviewed, these opinions may be altered and/or reinforced depending upon what information is obtained, reviewed, considered, and/or studied.

Further Development - The opinions expressed in this report are not necessarily final in nature. Rather, they are listed to comply with current report requests. Each opinion may be further developed through research, investigation, during deposition, and/or trial testimony.

Specific References - Some of the opinions in this report may list specific references to some of the documents reviewed and/or considered or specific references. These listings are not intended to be all inclusive. I specifically reserve the right to supplement the support for each of the opinions in this report.

Newly Identified Issues - If new issues are opined, identified, and/or developed subsequent to submission of this report, I reserve the right to supplement this report.

Degree of Certainty - All opinions stated in this report are in direct regard to the case captioned, and the underlying incident or events leading to this case, and are expressed to a reasonable, or higher, degree of professional certainty and/or probability.

Credibility Determinations - Credibility determinations are solely and exclusively within the province of the trier of fact.

Fact Determination Preference - While there are few, if any, facts in issue in this case if a fact is in issue I endeavored to make such fact priority clear.

FRCP 26(a)(2)(B)(iv) Witness's Qualifications Include[1]:

I have a very broad and great depth of training, experience, skill, and education, and possess specialized, scientific, and technical, knowledge, in law enforcement, law enforcement force option areas including, use of force, force options, law enforcement practices, effects of force options, specifically including electronic weapons, including the TASER International, Inc. (TASER®), since April 5, 2017 Axon Enterprise, Inc. (Axon), conducted electrical weapons (CEWs), and specifically including the TASER X26™ CEW, TASER M26 CEW, TASER C2 CEW, TASER X3 CEW, TASER X2 CEW, and TASER X26(P) CEW.

Formal Education. I have a B.S. in Business Administration, M.S. in Management Technology, and Juris Doctor (J.D.) degree. I have attended other classes in other degree programs. I am a licensed attorney in Minnesota, Wisconsin, and (limited in-house) in Arizona, including being admitted to numerous federal district courts, courts of appeal, and the United States (U.S.) Supreme Court. I have been admitted *pro hac vice* in numerous court proceedings, and have participated in coroner's inquests as a company representative in Canada and the United Kingdom.

(Part-Time (PT)) Sworn Law Enforcement Officer:

I have served as a sworn PT Wisconsin (WI) law enforcement officer since 1980. My experience includes serving as a PT Patrol Captain, Lieutenant, field training officer (FTO), training officer, and legal advisor. I have observed and investigated criminal activities and have arrested, restrained, and handcuffed > 1,000 people; including > 100 arrests for operating vehicle while intoxicated. For over a decade as a WI law enforcement trainer I was certified to instruct up to twenty-two (22) subject areas.

At the United States (U.S.) Department of Justice (DOJ) I served as Chief, Intelligence and Investigative Operations Unit, and the Deputy Director, Federal Witness Security Program, International Operations, Office of Enforcement Operations (OEO), Criminal Division, Washington, D.C. (5/97 - 1/02); also a Division Security Officer and Watch Officer; OEO Firearms Training Officer; and an Occupancy Evacuation Coordinator. National Security Information (NSI) security clearance level was above Top Secret; including courier credentials.

Law Enforcement Force Option Training Certifications:

My training as a law enforcement force-option instructor began in the late 1970s. The instructor programs initially attended and certifications attained included firearms (handgun, shotgun, rifle, and submachine gun). I held a Class III Alcohol, Tobacco, and Firearms, U.S. Department of the Treasury firearms dealer's license (including Class III) for several years. From 1993 to 2004 I served as President of a small Wisconsin company (Personal Defense Systems, Inc.) that marketed products including chemical weapons, force options, and Stop Sticks.

Over the years I have participated in force-options instructor programs, and received instructor certifications in, force options including: baton/impact force options (Monadnock® PR-24, Pneu-Gun Ballistic Baton, Tactical Baton, Tactical Glove); Psycho-Motor Skill Design (PSDI); Lateral Vascular Neck Restraint (LVNR); chemical and inflammatory agents (Captsun II,

[1] See current Curriculum Vitae for further details and specifics. My curriculum vitae containing details of my relevant formal education, training, experience, publications authored, and a listing of any cases in which testimony (deposition and/or trial) as an expert has been taken is attached hereto and made an integral part hereof.

oleoresin capsicum (OC), chloroacetophenone (CN), orthochlorobenzalmalonotrile (CS), Defensive Tactics Institute (DTI), Defense Technologies, Inc., Aerosol Subject Restraint, Mace Security International, PepperBall®); distractionary munitions (special purpose low lethality anti-terrorist munitions, distractionary devices); defensive tactics; spontaneous knife defense; handcuffing and restraint (DTI, RIPP® Restraints); and various electronic weapons.

Law Enforcement Organizations:

My experience includes serving as a faculty member, presently Reserve Faculty, for the Americans for Effective Law Enforcement (AELE), Law Enforcement Legal Center; Legal Advisor and an Advisory Board member of the International Law Enforcement Educators and Trainers Association (ILEETA); former Board member and Legal Advisor to the Institute for the Prevention of In-Custody Deaths (IPICD); former Board Member of the Scientific Combatives Group International. Additionally, I have served on the National Advisory Boards of the Police Law Institute, the Jail Law Institute, and DTI; former member of the Executive Board of American Society for Law Enforcement Trainers/Training (ASLET); Executive Committee Member of the Legal Officers' Section (LOS) of the International Association of Chiefs of Police (IACP) [presently an IACP Life Member]; and as a consultant and author to the Law Enforcement Legal Defense Manual. Also held memberships in other organizations including, but not limited to, the International Association of Law Enforcement Firearms Instructors (IALEFI) and National ALERT. Also, a Senior Member, Institute of Electrical and Electronics Engineers (IEEE), Engineering in Medicine and Biology Society (EMBS).

Law Enforcement Training Programs Presented:

Since the early 1980s, I have presented 100s of law enforcement training programs or presentations, the majority of which were force related. These presentations were mostly in the U.S.; international programs included: Mexico, Canada, Panama, Austria, and the United Kingdom. These presentations and training programs have included National and International Law Enforcement and Risk Management Conferences, including, but not limited to: the IACP, ASLET, ILEETA, IPICD, IALEFI, AELE, Public Risk Management Association (PRIMA), State Risk and Insurance Management Association (STRIMA), International Municipal Lawyers Association (IMLA), and others. I have provided force training to many organizations and law enforcement agencies including the instructional staff at the U.S. Secret Service Academy.

Policy/Procedures, and Best Practices Development, Publications, and Training:

I have been researching, writing, editing, critiquing, teaching, presenting, and commenting on law enforcement policies, practices, general orders, procedures, guidelines, and best practices since the early 1980s. I have authored specific language and sample guidance on various uses of force and force options. I have critiqued and commented on many force-related law enforcement policies at the federal, state, county, and local levels.

I have authored several policy-related publications and have presented many training programs regarding and involving force-option policies, procedures, general guidelines, etc.

Model policy and best practices development participation includes, executive session participant, 2011 Electronic Control Weapons Guidelines, Police Executive Research Forum (PERF), Philadelphia, Pennsylvania; and significant contributor, editor, and peer reviewer for the March 2018 Electronic Control Weapons Model Policy, Concepts and Issues Paper, and Need to Know. IACP Law Enforcement Policy Center, Alexandria, Virginia.

Standards Participation (less lethal, CEW, etc.):

I serve as Axon Technical Advisor on National and International CEW Standards and Standards Organizations. I was a committee participant to International Electrotechnical Commission (IEC), IEC 62792 (2015) Edition 1.0, Measurement method for the Output of electroshock weapons. I co-authored D. Panescu, M. Nerheim, M. W. Kroll and M. A. Brave, "New Conducted Electrical Weapons: Electrical Safety Relative to Relevant Standards," *Conf Proc IEEE Eng Med Biol Soc*, vol. 39, Jul 2017, pp. 2185 - 2190. I served as ILEETA organization representative to American National Standards Institute (ANSI)/CPLSO-17-2017, Electrical Characteristics of ECDs and CEWs.10/11/2017. I serve as Member and Task Group Participant to American Society for Testing and Materials) (ASTM), Committee: E54 Homeland Security Applications, Subcommittee: E54.08 Operational Equipment, including Less-Lethal Task Group, including: ASTM (draft) Standard WK61808 New Test Method for Correct Performance of Less-Lethal Electroshock Weapons Used by Law Enforcement and Corrections; WK57087 Less Lethal Chemical Devices; and WK62829 Certification of Less Lethal Aerosol Devices Used by Law Enforcement and Corrections.

Force Option, Electronic Weapons, Conducted Electrical Weapons (CEWs[2]), Background:

My law enforcement electronic weapons instructor programs attended and certifications received include: Source (International Non-Lethal Weapons Association Academy 1983), Electronic Restraint Devices (DTI 1992), Advanced TASER CEW (2003), Stinger S-200, TASER Master Instructor, TASER Technician Course, and TASER Evidence Collection and Analysis.

In addition to the CEW-related publications, I have authored, X26(E), M26, X2, X3, C2, Strikelight, and X26(P) CEWs, electrical characteristics tables, appendices on basic electrical principles, how CEWs operate and function, how they deliver an electrical current to a subject, and numerous other Fact Sheets and other documents and materials. I have contributed to, edited, and authored TASER CEW specifications sheets and product specifications documents and materials (*e.g.* CEW cartridges).

Experience with Axon Enterprise, Inc. (formerly – since April 5, 2017 - TASER International, Inc. (TASER)) and its Electronic Weapons:

I first presented at the 2002 TASER annual conference; first served as a TASER retained consultant in 2002; became National Litigation Counsel in 2003 (National/International Litigation Counsel); have been actively involved in over 320 CEW-related litigations; have worked closely with many CEW-related experts; have deposed, or been present during depositions of, many CEW-related force, medical, pathology, toxicology, scientific, electrical, and engineering experts; became a TASER CEW instructor in January 2003, and a TASER CEW Master Instructor in May 2003; became a part-time (32 hours per week) TASER employee in June 2005; transitioned to a full-time TASER employee in December 2005; and transitioned to part time in January 2018, served as Legal Advisor to the TASER Training Board (TAB) from 2004 to July 2017, and serve as Legal Advisor to the TASER Scientific and Medical Advisory Board (SMAB); serve as the primary Person Most Knowledgeable (PMK) in law enforcement CEW-related depositions, inquests, and inquiries; serve as Axon's Technical Advisor on National and International CEW Standards and Standards Organizations; and serve as TASER's Director of Scientific and Medical Research Group. Provide information, summaries, papers, conceptual foundations, etc. regarding TASER CEWs; electrical concepts; operations, mechanics, scientific literature; force issues; policies, procedures, and best practices; etc. on a

[2] CEW is synonymous with Electronic Control Device (ECD), Electroshock Weapon (ESW), Conducted Energy Weapon (CEW), and other such names and acronyms for electronic weapons.

daily basis. I created and maintain an indepth selected science, numbers, and legal outline related to CEWs, arrest-related deaths (ARDs), excited delirium syndrome (ExDS), and selected other subjects and concepts.

TASER researches, analyzes, and provides extensive training materials, product manuals, warnings, and other materials to its law enforcement customers. TASER has trained and certified over 2,400 master instructors and over 65,000 instructors. As legal advisor to the TAB I was deeply involved in all aspects of the TASER training programs and materials, and still am. I have presented at most, almost all from 2004 to June 2017, Master Instructor Programs and since 2004 I have served as a primary author, contributor, and editor of TASER training materials.

Electronic Weapons Effects, Risk Analysis, and Warnings:

My training, knowledge and experience providing me with scientific, technical, and specialized knowledge includes in-depth continuous research and analysis of electronic weapons issues, including, but not limited to: electrical basics and effects, CEW use modes, risks and benefits, and many other aspects and issues of electronic weapons. I serve as a lead researcher, author, contributor, and editor on TASER CEW related training and warnings materials and documents. I have played an integral role in development, refinement, editing, etc. of TASER CEW related product warnings since 2004. Since 2005 I have been the primary point person for the product warnings and CEW risk exposure waivers.

I have played an integral role in the development, editing, etc. of TASER training program versions: Version 12 (Jan. 2005); Version 13 (May 2006); Version 14 (Dec. 2007); Version 14.2 (Aug. 2008); Version 15 (Aug. 2009); Version 16 (Nov. 2009); Version 17 (May 2010); Version 18 (July 2011); and Version 19 (Apr. 2013), Version 20 (January 2016), and Version 20.2 (January 2018). I am the lead author on the TASER Training Annual User Update PowerPoints (TASER Training Version 17 to present).

Since 2002, I have presented at many TASER Annual Training Conferences; Master Instructors' Schools; and TASER Use of Force, Risk Management and Legal Strategies, For Chiefs, Sheriffs, Risk Managers and Legal Advisors programs.

I am designated by TASER as the Person Most Knowledgeable (PMK) regarding history of TASER CEWs; how TASER CEWs work; CEW related electrical concepts and demonstrations, how CEWs are operated; mechanics of CEWs, modes of operation; CEW medical, scientific, electrical, and engineering research and literature; how CEWs affect the human body; TASER CEWs generally; TASER training; TASER warnings; uses of CEWs; research and literature regarding electronic weapons, arrest related deaths (ARDs), etc.; effects of CEWs, CEW risk/benefits; and numerous other areas. I have testified in several civil, criminal, and coroners' inquests cases regarding electronic weapons including in the United States, Canada, and the United Kingdom. I assist with providing CEW information regularly, usually weekly.

Electronic Weapon Related Patent. I am the first listed Inventor on Patent 8,976,024, March 10, 2015, Systems and Methods for Electronic Control Device with Deactivation Alert.

CEW-Paper Invited Peer-Reviewer. I served as a CEW-paper invited peer–reviewer for *Medicine, Science, and the Law*, the Journal of the British Academy of Forensic Sciences. I have also served as a peer-reviewer for other non-CEW papers for journal publication.

Force Continuums Articles Published. I have authored force-continuum-related articles, have included force continuums as a significant part of various training programs, and on October 3,

2009, I moderated the Legal and Practical Issues in Force Models and Continuums, Moderator, LOS Track, IACP Annual Conference, Denver, Colorado.

Arrest-Related Deaths (ARDs) Experience: My experience includes well over two decades of reviewing, analyzing, interpreting, and commenting on 100s (well over 400) of ARDs, including autopsy reports in deaths temporal to CEW involvement. I have been involved in closely monitoring, reviewing, analyzing, discussing, commenting, and opining on 100s of ARDs, CEW, and other force-option temporal events. These experiences were based upon my knowledge, experience, education, training, and skills as well as my extensive studies and writings on CEWs and their real and alleged effects on humans, as well as animals. Also, I have served as an expert in over 200 litigated cases involving use of force, including ARDs and CEWs, in addition to the above brief listing and my attached detailed CV. Also, co-authored abstract and PowerPoint presentation for the Annual National Association of Medical Examiners (NAME) Conference, Portland, Oregon, on September 23, 2014 [Medical Examiner Collection of Comprehensive, Objective Medical Evidence for Conducted Electrical Weapons and Their Temporal Relationship to Sudden Arrest], as well as October 3, 2015: Conducted Electrical Weapons: Understanding the Basics, in Charlotte, North Carolina.

Additional Electronic Weapon Knowledge, Skill, Experience, Training, Education

I first received an electronic-weapon instructor certification over 3 decades ago. I possess significant in-depth knowledge, skill, experience, training, and education, and possess scientific, technical, and other specialized knowledge regarding electronic weapons, specifically including TASER CEWs, modes of use, including possessing, carrying, brandishing, displaying, LASER painting, discharging, deploying, or otherwise use of the CEW in particular manners or circumstances. I have attended 100s of hours of electronic weapons' training, have experienced electronic weapons discharges many times, have extensively researched the scientific and technical literature that exists regarding electronic weapons, have seen 100s of people exposed or experience an electronic-weapon exposure, have seen and researched the effects of electronic weapons; have presented 100s of hours of training involving CEWs; have exhaustively researched, critiqued, commented on, and edited, CEW-related policies, procedures, general orders, guidelines, and best practices regarding CEW effects and appropriateness of use; demonstrating electronic weapon electrical flow, completed electrical circuit, delivered electrical charge, and effects; etc.

Law Enforcement Publications Authored: In over 3 decades, I have authored, or co-authored, 74+ periodical publications, 6 book chapters, 17 videos, 100s of training program manuals and PowerPoint® presentations regarding law enforcement concepts, issues, procedures, majority of which were force-option involved or related. My published articles have appeared in periodicals including the Institute of Electrical and Electronics Engineers (IEEE) Engineering in Medicine & Biology Society (EMBS); Medicine, Science and the Law; International Journal of Case Reports and Images (IJCRI); *The Journal of Law Enforcement*; Police Chief; American City & County; Prosecutor; Police & Security News; Public Risk; ASLET Journal; Casino Enterprise Management; the International Use of Force Journal; and the Law Enforcement Legal Defense Manual. I have presented several programs on the Law Enforcement Television Network (LETN).

FRCP 26(a)(2)(B)(iv) publications authored in the previous 10+ years

- Peters, John G., and Brave, Michael A., Force Continuums: Three Questions, *Police Chief*, Chief's Counsel Section, January 2006, pages 8-9.

- Peters, John G., and Brave, Michael A., Force Continuums: Are They Still Needed, *Police & Security News*, January-February 2006, pages 53-59.
- Peters, John G., and Brave, Michael A., Sudden Death, "Excited" Delirium, and Issues of Force: Part IV - A Blueprint for Forensic Investigators, *Police & Security News*, September/October 2006, Vol. 22, Issue 5.
- Legal Basics for the CEW, Chap 31, TASER® Electronic Control Devices: Physiology, Pathology, and Law, by Mark W. Kroll (Editor), Jeffrey D. Ho (Editor), Published 2009.
- Brave, M. O'Linn, M. Bryan v. McPherson--A New Standard for Use of Electronic Control Devices? Chief's Counsel, *Police Chief*, vol LXXVII, no. 2. February 2010, pages 12–13.
- Legal Aspects of Conducted Electrical Weapon Injuries, Wounds, and Effects, Chap 8, 143-154, J.D. Ho et al. (eds.), Atlas of Conducted Electrical Weapon Wounds and Forensic Analysis, 1 DOI 10.1007/978-1-4614-3543-3_1, Springer Science+Business Media 2012.
- Brave, M. "Constant Constrictive Pressures to Avoid or Reduce Use of Force and the Quagmire of So-Called Best Practices," Chief's Counsel, *Police Chief*, 80 April 2013: 12–14.
- Dawes, D.M., Ho, J.D., Vincent, A.S., Nystrom, P.C., Moore, J.C., Steinberg, L.W., Tilton, A.M.K., Brave, M.A., Berris, M.S., Miner, J.R. 2013. The neurocognitive effects of simulated use-of-force scenarios. *Forensic Science, Medicine, and Pathology*, 2013, 1-9. (DOI) 10.1007/s12024-013-9510-y.
- Dawes, D., Brave, M. 'Stun gun' link to Raynaud's syndrome unconvincing. *International Journal of Case Reports and Images*. Published Online (Early View Article): 23 April 2014.
- Panescu, D., Kroll, M., and Brave, M. Transthoracic Cardiac Stimulation Thresholds for Short Pulses, Conf Proc IEEE Eng Med Biol Soc, 2014, 36, pp. 4471-4474.
- Panescu, D., Kroll, M., and Brave, M. Limitations of Animal Electrical Cardiac Safety Models, Conf Proc IEEE Eng Med Biol Soc, 2014, 36, pp. 6483-6486.
- Panescu, D., Kroll, M., Iverson, C., and Brave, M. The Sternum as an Electrical Shield, Conf Proc IEEE Eng Med Biol Soc, 2014, 36, pp. 4464-4470.
- Graham, M., Kroll, M.W., Karch, S.B., Wetli, C.V., Brave, M. Medical Examiner Collection of Comprehensive, Objective Medical Evidence for Conducted Electrical Weapons and Their Temporal Relationship to Sudden Arrest. National Association of Medical Examiners Annual Conference Abstract and PowerPoint Presentation, Portland, Oregon, September 23, 2014.
- Panescu, D., Kroll, M., and Brave, M. Cardiac Fibrillation Risks with TASER Conducted Electrical Weapons, Conf Proc IEEE Eng Med Biol Soc, 2015, 37, pp. 323-329.
- Medical Examiner Collection of Comprehensive, Objective Medical Evidence for Conducted Electrical Weapons and Their Temporal Relationship to Sudden Arrest. Forensic Science Error Management, International Forensic Symposium, Washington, DC.
- Confirmational bias and investigation of arrest-related deaths. Forensic Science Error Management, International Forensic Symposium, Washington, DC.
- Dawes D, Heegaard W, Brave M, Paetow G, Weston B, Ho J. Body-Worn Cameras Improve Law Enforcement Officer Report Writing Accuracy. *The Journal of Law Enforcement.* 2015;4(6).
- Brave, M.A., Lakkireddy, D.R., Kroll, M.W., Panescu, D. (2016) Validity of the Small Swine Model for Human Electrical Safety Risks. Conf Proc IEEE Eng Med Biol Soc, 2016, 38, pp. 2343–2348.
- Panescu, D., Kroll, M., Brave, M. (2016) Current Distribution in Tissues with Conducted Electrical Weapons Operated in Drive-Stun Mode. Conf Proc IEEE Eng Med Biol Soc, 2016, 38, pp. 5241–5245.
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Weapons and Their Temporal Relationship to Sudden Arrest'. World Academy of Science, Engineering and Technology, International Science Index, Law and Political Sciences, 3(1), 527. 74.

- D. Panescu, M. W. Kroll and M. A. Brave, “New Conducted Electrical Weapons: Finite Element Modeling of Safety Margins,” Conf Proc IEEE Eng Med Biol Soc, vol. 39, Jul 2017, pp. 2170 - 2176, 2017.
- D. Panescu, M. Nerheim, M. W. Kroll and M. A. Brave, “New Conducted Electrical Weapons: Electrical Safety Relative to Relevant Standards,” Conf Proc IEEE Eng Med Biol Soc, vol. 39, Jul 2017, pp. 2185 - 2190.
- D. Panescu, M. W. Kroll and M. A. Brave, “New Conducted Electrical Weapons: Thoracic Cage Shielding Effects,” Conf Proc IEEE Eng Med Biol Soc, vol. 39, Jul 2017, pp. 2191 - 2196, 2017.
- Kroll, M.W., Brave, M.A. 2017. Chapter 13: TASER-Conducted Electrical Weapons. Pages 246-271. Guidelines for Investigating Officer-Involved Shootings, Arrest-Related Deaths, and Deaths in Custody, edited by Darrell L. Ross and Gary M. Vilke, Routledge Taylor & Francis Group, New York, and London. Available July 2017. https://www.routledge.com/Guidelines-for-Investigating-Officer-Involved-Shootings-Arrest-Related/Ross-Vilke/p/book/9780323296236.
- Ross, D.L., Brave, M., Kroll, M. 2017. Chapter 1: Arrest-Related Deaths, Emerging Questions, and Conpeting Expectations in Investigations. Pages 1-18. Guidelines for Investigating Officer-Involved Shootings, Arrest-Related Deaths, and Deaths in Custody, edited by Darrell L. Ross and Gary M. Vilke, Routledge Taylor & Francis Group, New York, and London. Available July 2017. https://www.routledge.com/Guidelines-for-Investigating-Officer-Involved-Shootings-Arrest-Related/Ross-Vilke/p/book/9780323296236.
- Ross, D.L., Brave, M. 2017. Chapter 2: Vital Statistics and Arrest-Related Deaths. Pages 19-40. Guidelines for Investigating Officer-Involved Shootings, Arrest-Related Deaths, and Deaths in Custody, edited by Darrell L. Ross and Gary M. Vilke, Routledge Taylor & Francis Group, New York, and London. Available July 2017. https://www.routledge.com/Guidelines-for-Investigating-Officer-Involved-Shootings-Arrest-Related/Ross-Vilke/p/book/9780323296236.
- Brave, M., Karch, S. What Medical Examiners Should Expect When They Use the Term "Arrest-Related" Inappropriately. 2017 Forensic Science Error Management, International Forensics Symposium, National Institute of Standards and Technology (NIST), U.S. Department of Commerce and Federal Bureau of Investigation (FBI), 24-27 July 2017, NIST, Gaithersburg, Maryland.
- Karch, S., Brave, M. Minimizing Errors: What is a Negative Autopsy? 2017 Forensic Science Error Management, International Forensics Symposium, National Institute of Standards and Technology (NIST), U.S. Department of Commerce and Federal Bureau of Investigation (FBI), 24-27 July 2017, NIST, Gaithersburg, Maryland. DOI: 10.13140/RG.2.2.26463.56482.
- M.W. Kroll, M.B. Ritter, E.A. Kennedy, N.K. Silverman, R. Shinder, M.A. Brave, H.E. Williams. "Eye injuries from electrical weapon probes: Incidents, prevalence, and legal implications," *Journal of Forensic and Legal Medicine*, 2018.
- Papers or book chapters in various stages of development, review, or in press.

FRCP 26(a)(2)(B)(v) 4+ years of cases with trial/deposition testimony: (I have been retained as an expert in > 200 cases).

- 06/23/11: Hearing: Quilem Registre, Montreal, Quebec, Canada.
- 03/23/12: Depo: Alusa v. Salt Lake County, USDC DUt., No. 2:11-CV-00184.
- 10/29/12: Depo: Jackson v. Onondaga, USDC NDNy., No. 5:09-CV-1182.
- 01/15/13: Depo: Wojcik v. Johnson, LaPorte Co. Sup. Ct, IN, No. 46D03-0912CT659.
- 01/27/13: Coroner's Inquest: Dale Burns, Cumbria, United Kingdom.

- 06/07/13: Trial: Meyers v. Spring Valley, USDC SDNy, No.11-CV-01189 (VLB).
- 09/30/13: Depo: Mitchell v. TASER, USDC EDMi., No. 5:09-cv-11480.
- 03/20/14: Depo: Morabito v. Holmes, USDC EDOh., No. 1:13-CV-351.
- 08/04/14: Depo: Salgado v. Miami-Dade County, USDC SDFl., No. 12-cv-24458.
- 01/23/15: Depo: Soto v. Heanue, USDC DCt., No. 3:10-CV-00106(WWE).
- 07/14/15; Trial: Van Raden v. Larsen, USDC MN, No. 13-cv-02283 DWF/LIB
- 11/10/15; Depo: Brossart v. Janke, USDC ND, No. 3-14-cv-62.
- 05/11/16; Trial: Illinois v. McCaslin, Winnebago, Co., No. 11CF1137 (11TC4022).
- 11/30/16: Coroner's Inquest: Craig McDougall, Winnipeg, Canada.
- 12/14/16: Trial: Georgia v. Eberhart/Weems, 15SC136846/15SC136846.
- 02/09/17: Depo: Stephens v. City of Tarrant, USDC NDAL 2:16-cv-274-KOB.

FRCP 26(a)(2)(B)(ii) Facts or Data Considered Include

FRCP 26(a)(2)(B)(ii) case specific facts or data considered:

- Plaintiff's Complaint
- Plaintiff's Motion for Preliminary Injunction
- Defendant's Response to Plaintiff's Motion for Preliminary Injunction
- Defendant's Initial Disclosures
- Plaintiff's Initial Disclosures
  - https://www.dropbox.com/s/oj8a1680bo74067/Core%20Disclosures.pdf?dl=0
- Defendant's Responses to Interrogatories, Request for Admission and Request for Production of documents
- Defendant's Production of Documents
- Order on Plaintiff's Preliminary Injunction
- Executed Protective Order covering Defendant's Production of Documents
- NY Penal Law 265.00
- NY Penal Law 265.01
- NY Penal Law 265.20
- NY Health Code Section 54.3 (self defense spray regs)
- NY Health Code Section 54.2 (self defense spray regs)

FRCP 26(a)(2)(B)(ii) non case specific facts or data considered (including referenced documents/materials), also, these documents are the FRCP 26(a)(2)(B)(iii) exhibits**:**

- TASER Training Program Version 20.2 [January 15, 2018]. (hereinafter TRAINING).
- TASER Handheld CEW Warnings, Instructions, and Information: Law Enforcement dated May 19, 2017. (hereinafter LE WARNINGS).[3]
- TASER CEW Warnings, Instructions, and Information: Citizen dated May 19, 2017 (hereinafter CITIZEN WARNINGS).[4]
- Outline of Partial Selected CEW Research and Information, March 30, 2018.[5] (most current version hereinafter referred to as "Outline"). In this report the references provided are to the March 30, 2018, version of the Outline. [I hereby incorporate specifically identified relevant sections, information, references, etc. of my Outline into this report, and with each such reference as provided fully incorporated as though included fully and completely within this report. This is done to be fully inclusive of relevant and/or supporting information while prevent unnecessary duplication.]
- Conducted Electrical Weapon (CEW) Research Index, current dated 14 February 2018
- Brief Introduction to TASER® Electronic Control Devices (ECD), History, Electricity, Electrical Stimulation, Electrical Measurements, and the Human Body, July 14, 2012.[6]
- TASER® Conducted Electrical Weapon (CEW) Training in General, May 1, 2013.
- Demonstrations Outline.
- Literature included in text and footnote citations within this report and its references.

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[3] Available at https://axon.cdn.prismic.io/axon%2F100852d3-e500-4903-811b-70237da3946d_law-enforcement-warnings+8-5x11.pdf .

[4] Available at https://axon.cdn.prismic.io/axon%2F3709334e-e376-451f-a48f-5e7ab4d3a6a3_citizen+warnings.pdf.

[5] This document is updated often. The current version is available at http://www.ecdlaw.info/1.pdf.

[6] Available at http://www.ecdlaw.info/outlines/2012--07-14%20Smith%20&%20Brave%20ECD%20Appendix.pdf

Abbreviated Statement of Relevant Facts

This Abbreviated Summary of Relevant Facts is merely a compilation of some of the reports and statements attributable to some of the incident participants, witnesses, and others who interacted or witnessed the incident giving rise to this case. It is not intended as, nor should it be considered as, a complete statement of the actual occurrence.

Case/Incident Relevant (to this Report) Dates:

May 19, 2017 – TASER® Conducted Electrical Weapon (CEW) warnings

January 15, 2018 – TASER Training Version 20.2 (including: Annual CEW User Update PowerPoint)

Definition of "Active Resistance":

"Active Resistance"

(PERF) A subject's physical actions to defeat an officer's attempt at control and to avoid being taken into custody. Verbal statements alone do not constitute active resistance.[7]

(DOJ) "means a subject attempts to attack or does attack an officer; exhibits aggressive behavior (e.g., lunging toward the officer, striking the officer with hands, fists, kicks or any instrument that may be perceived as a weapon such as knife or stick); or exhibits defensive resistance (e.g., attempts to leave the scene, flee, hide from detection, or pull away from the officer's grasp). Verbal statements, bracing, or tensing alone do not constitute active resistance."[8]

[7] 2011 Electronic Control Weapon Guidelines, A joint project of Police Executive Research Forum and Community Oriented Policing Services, U.S Department of Justice, page 41.

[8] Consent Decree Regarding the New Orleans Police Department, Filed July 24, 2012, United States of America v. City of New Orleans, U.S.D.C., EDLA, Case 2:12-cv-019240-SM-JCW, page 4.

A Few Use-of-Force Basics

Categories of Force Options are Not Equal:

Various force-option categories have many discernable differences and potential foreseeable effects. Just like with firearms there are significant differences between a .22 calibre Derringer and a .50 calibre sniper rifle. A simple way to look at this is to compare a force-option category to "balls." While all balls are likely round, if used as a force option they can be very different. "Balls" can include nerf, ping-pong, tennis, racquet, paint ball, pepper ball, football, basketball, soccer ball, volley ball, medicine ball, bowling ball, and wrecking ball. Just like there is significant potential injury potential differences in using a ball as a weapon (such as a nerf ball versus a bowling or wrecking ball) there are also significant differences for any force-option category. Just as a few simple examples:

- **Physical striking techniques**
- **Physical defensive tactics, grappling, grounding techniques**
- **Physical body throwing techniques** – can often be performed with different injury potential to the subject. Such as, (1) a person can be thrown to the ground in such a way as to allow him to catch himself and reduce the impact, (2) person can be thrown to the ground while controlling the arms to prevent the person from being able to lower the impact trauma, or (3) the person can be thrown in such a way as to impact a particular body part to induce more trauma to the impact point.
- **Chemical aerosols** – commonly used chemical aerosol personal defense sprays include oleoresin capsicum (OC or "pepper spray"), chloroacetophenone (CN), orthochlorobenzylmalonitrile (CS), PAVA, or various blends of OC, CN, or CS. These can be in different sizes, blends, compositions, concentrations, propellants, dispersal mechanism, etc. Due to these, and other, differences chemical aerosols can have broadly varying uses, environments, effects, etc.
- **Electronic weapons –** can vary greatly in design, waveform, discharge, electrode location, expected and actual effects, objective accountability and evidentiary features, etc.
- **Impact or kinetic force options** (such as batons, sticks, etc.)
- **Improvised or unconventional weapons**

Almost Anything Can Have the Potential to Cause or Contribute to Death:

Common household items have the potential for death. And, every force option available to law enforcement, as well as civilians, has the potential to cause or contribute to death. Deaths have been attributed to police canines, OC spray, chemical aerosols, impact weapons, prone positioning, hands-on physical control, control holds, takedowns, personal weapons, improvised weapons, construction tools, footwear, restraint techniques, and others.

Just as an example, pencils can be lethal. "[A]lthough . . . a pencil commonly is used to write or sketch, and not to hurt other people, a pencil surely has the capacity to be used to inflict serious bodily injury when it is jabbed into a mouth, an eye or a blood

vessel."[9] Everything has the "potential" to be "lethal." Peanuts have the potential to be lethal to someone with peanut allergies. Acetaminophen, the active ingredient in Tylenol and Nyquil is responsible for over 33,000 hospitalizations each year and 1,567 deaths in the last decade. Highchairs have labels warning of the risk of death, as do household fans and ladders.

TASER CEWs are generally considered by courts to be "non-deadly force," not "deadly force," "a non-deadly weapon," "less-than-lethal force," "less-than-deadly force," "non-lethal," "non-lethal force," and "less-lethal weapons." See, Outline:

[9] *State v. Doss*, 2007 WL 3071034 (N.J. Super. App. Div. Oct. 23, 2007). Also, see, *U.S. v. Vahovick*, 160 F.3d 395, 397 (7th Cir.1998) (holding that several sharpened pencils bound together with tape in prisoner's possession constituted a deadly weapon); and *State v. Barragan*, 9 P.3d 942, 945 (Wash. App. 2000) (treating pencil as a deadly weapon).

Personal Defense Aerosols Sprays – A Sampling of Basics

The Petty (2004)[10] study, funded by the National Institute of Justice (NIJ), United States (U.S.) Department of Justice (DoJ), observed that "[t]he effectivity of O.C. is approximately I in 5[20%], but this study included "violent" subjects alone, so violent that death ensued, from the confrontation." With regard to Petty (2004), in April 2003 the NIJ published *The Effectiveness and Safety of Pepper Spray*[11] that included "[t]he [Petty (2004)] study of in-custody deaths concluded that pepper spray contributed to death in two of the 63 cases, both involving people with asthma. In the other cases, the researcher concluded that [OC use temporal] death was caused by the arrestee's drug use, disease, positional asphyxia, or a combination of these factors."

The Bertilsson (2017)[12] study looked at "situational conditions and effectiveness of using OC spray … in one of Sweden's then [21] Police Departments, the Skåne (Scania) County Police Department, during a 7-year period from 2006 to 2012." The study found in part "the operative range [of pepper spray] was often <2 m and it took between 3 and 5 s of spraying before obtaining effect, partly owing to the difficulties of hitting a small, sometimes erratically moving target. Collateral hits were noted in 24% of the incidents, whereof 90% were other officers. Noteworthy, in 21% of incidents officers put themselves at large personal risk by using OC at close range against people armed with lethal weapons. Hence, OC emerges as a suitable tool for handling low threat situations but lacks key traits to ensure safe and efficient policing of high threat situations," The study also included significant analysis of "[t]he design of the OC device can influence a number of the operative parameters, e.g., the maximum range, precision, sensitivity to wind and time to reach effect (Heal et al., 2010)."

As Bertilsson (2017) includes "collateral hits were noted in 24" of incidents." This is important because pepper spray, and similar aerosol weapons, can have significant negative collateral effects if used in in-door, enclosed, or crowded environments, such as shopping malls, businesses, schools, hospitals, personal residences, apartment buildings, or at sporting events, concerts, fairs, etc.

Haar's (2017)[13] paper found "… chemical weapons … have significant potential for misuse, leading to unnecessary morbidity and mortality." In reviewing 31 studies from 11 countries identified "5131 people who suffered injuries, two of whom died and

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[10] Petty, Charles S. "Deaths in police confrontations when oleoresin capsicum is used." unpublished report prepared for the US Department of Justice 9 (2004).

[11] Bowling, Michael, Monica Gaines, and C. Petty. "Effectiveness and safety of pepper spray." NCJ 195739 (2003).

[12] J. Bertilsson, U. Petersson, P. J. Fredriksson, M. Magnusson & P. A. Fransson (2017) Use of pepper spray in policing: retrospective study of situational characteristics and implications for violent situations, *Police Practice and Research*, 18:4, 391-406, DOI: 10.1080/15614263.2017.1288119.

[13] Haar, Rohini J., Vincent Iacopino, Nikhil Ranadive, Sheri D. Weiser, and Madhavi Dandu. "Health impacts of chemical irritants used for crowd control: a systematic review of the injuries and deaths caused by tear gas and pepper spray." *BMC Public Health* 17, no. 1 (2017): 831.

58 of whom suffered permanent disabilities. Out of 9261 total injuries, 8.7% were severe and required professional medical management, while 17% were moderate and 74.3% were minor. Severe injuries occurred to all body systems, with the majority of injuries impacting the skin and eyes." The Haar (2017) Abstract:

> **Background:** Chemical irritants used in crowd control, such as tear gases and pepper sprays, are generally considered to be safe and to cause only transient pain and lacrimation. However, there are numerous reports that use and misuse of these chemicals may cause serious injuries. We aimed to review documented injuries from chemical irritants to better understand the morbidity and mortality associated with these weapons.
>
> **Methods:** We conducted a systematic review using PRISMA guidelines to identify injuries, permanent disabilities, and deaths from chemical irritants worldwide between January 1, 1990 and March 15, 2015. We reviewed injuries to different body systems, injury severity, and potential risk factors for injury severity. We also assessed region, context and quality of each included article.
>
> **Results:** We identified 31 studies from 11 countries. These reported on 5131 people who suffered injuries, two of whom died and 58 of whom suffered permanent disabilities. Out of 9261 total injuries, 8.7% were severe and required professional medical management, while 17% were moderate and 74.3% were minor. Severe injuries occurred to all body systems, with the majority of injuries impacting the skin and eyes. Projectile munition trauma caused 231 projectile injuries, with 63 (27%) severe injuries, including major head injury and vision loss. Potentiating factors for more severe injury included environmental conditions, prolonged exposure time, and higher quantities of chemical agent in enclosed spaces.
>
> **Conclusions:** Although chemical weapons may have a limited role in crowd control, our findings demonstrate that they have significant potential for misuse, leading to unnecessary morbidity and mortality. A nuanced understanding of the health impacts of chemical weapons and mitigating factors is imperative to avoiding indiscriminate use of chemical weapons and associated health consequences.
>
> **Keywords:** Crowd control, Less lethal weapons, Tear gas, Pepper spray, Protests, Demonstrations, 2-chlorobenzalmalonitrile (agent CS), Oleoresin capsicum (agent OC), Pelargonic acid vanillylamide or capsaicin II (PAVA)

The Kearney (2014)[14] paper looked at "a total of 4,544 cases were identified and 3,671 met the inclusion criteria. Of these, 249 cases (6.8%) were found to have more severe symptoms that warranted a medical evaluation. There were no reported deaths. The cases with more severe symptoms most commonly involved the ocular (53.8%), respiratory (31.7%), and dermal (17.7%) organ systems." And, the conclusion included: a "1 in 15 potential risk for more severe adverse health effects in persons exposed to pepper spray that warranted a medical evaluation." The Kearney (2014) Abstract:

> **Background.** Pepper spray is a common lacrimator used by law enforcement and the public to subdue individuals and for self-defense. The risk factors for severe injury due to pepper spray

[14] Thomas Kearney, Patricia Hiatt, Elisabeth Birdsall & Craig Smollin (2014) Pepper Spray Injury Severity: Ten-year Case Experience of a Poison Control System, *Prehospital Emergency Care*, 18:3, 381-386, DOI: 10.3109/10903127.2014.891063.

exposure are not well documented and there is a lack of guidelines to identify patients that require transport and medical evaluation in an emergency department.

Objective. The aim of this study was to determine the prevalence of and circumstances associated with symptoms suggestive of tissue injury beyond transient irritation in persons exposed to pepper spray.

Methods. We reviewed all human exposures to pepper spray reported to a poison control system between 2002 and 2011. Cases were differentiated into 2 outcome groups: minor or self-limiting symptoms versus those with more severe symptoms suggestive of tissue injury that warranted a medical evaluation. A comparison of the variables between the outcome groups was performed using odds ratios (ORs), 95% confidence intervals (CIs), and associated P values.

Results. A total of 4,544 cases were identified and 3,671 met the inclusion criteria. Of these, 249 cases (6.8%) were found to have more severe symptoms that warranted a medical evaluation. There were no reported deaths. The cases with more severe symptoms most commonly involved the ocular (53.8%), respiratory (31.7%), and dermal (17.7%) organ systems. Factors with largest independent associations with more severe outcomes were use for law enforcement training (OR, 7.39; 95% CI, 2.98–18.28), direct intentional exposure for purposeful use to incapacitate (OR, 3.02; 95% CI, 1.80–5.06), and for law enforcement on individual target suspects or crowd control (OR, 2.45; 95% CI, 1.42–4.23).

Conclusions. There was a low 1 in 15 potential risk for more severe adverse health effects in persons exposed to pepper spray that warranted a medical evaluation. The risk was highest when used for training of law enforcement personnel and involved severe ocular symptoms. This suggests that routine use of pepper spray for training of law enforcement or military personnel be reconsidered. Protective goggles may be an option when direct spraying into the face of trainees. Transport for medical evaluation should be considered for exposed persons that manifest persistent ocular or respiratory symptoms.

Key words: capsaicin; tear gas; pepper spray; eye injury; respiratory injury

The U.S. Department of Transportation considers pepper spray a hazardous material.[15]

In *Young v. County of Los Angeles*[16] the United States Court of Appeals for the Ninth Circuit stated that “Pepper spray "is designed to cause intense pain," and inflicts "a burning sensation that causes mucus to come out of the nose, an involuntary closing of the eyes, a gagging reflex, and temporary paralysis of the larynx," as well as "disorientation, anxiety, and panic." *Headwaters Forest Defense v. County of Humboldt*, 240 F.3d 1185, 1199-1200 (9th Cir.2000), vacated and remanded on other grounds, 534 U.S. 801, 122 S.Ct. 24, 151 L.Ed.2d 1 (2001); see also *United States v. Neill*, 166 F.3d 943, 949-50 (9th Cir.1999) (affirming district court finding that pepper spray is a "dangerous weapon" under the U.S. Sentencing Guidelines and describing trial evidence that pepper spray causes "extreme pain" and is "capable of causing 'protracted impairment of a function of a bodily organ' " as well as lifelong health problems such as asthma). The evidence includes a declaration by a retired Los Angeles County Sheriff's Department lieutenant who testified as a police practices

[15] 49 CFR § 173.140(a) and § 173.115.
[16] *Young v. County of Los Angeles*, 655 F.3d 1156 (C.A.9 (Cal.), August 26, 2011).

expert and stated that the basic curriculum of the California Commission on Peace Officer Standards and Training [FN7] (POST) instructs officers that "the use of pepper spray can have very serious and debilitating consequences," and that "[a]s such, it should only be generally used as a defensive weapon and must never be used to intimidate a person or retaliate against an individual."

> FN7. The Commission sets minimum training standards for all California law enforcement personnel. See The Commission on Peace Officer Standards and Training, Commission on POST--Home, http://post.ca.gov/ (last visited August 19, 2011).

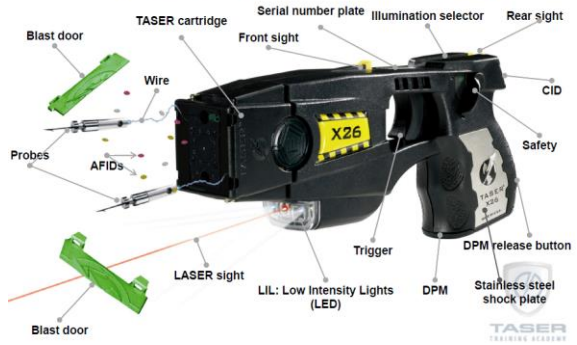
Also, a police officer's use of baton blows, too, presents a significant use of force that is capable of causing pain and bodily injury, and therefore, baton blows, like pepper spray, are considered a form of "intermediate force." Mohr, 318 F.3d at 623. Young's evidence shows that California law enforcement officers are taught that a baton is a deadly weapon that can cause deep bruising as well as blood clots capable of precipitating deadly strokes, and that batons should therefore be used "only as a response to aggressive or combative acts."

Basics: TASER X26(E) CEW Background Information

1. Basics TASER X26(E) CEW:

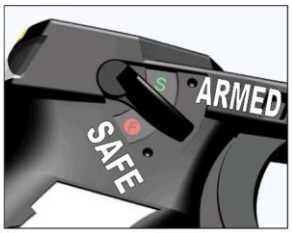
TASER X26

Constructed of impact resistant sonic welded polymer. Mass = 7 ounces.



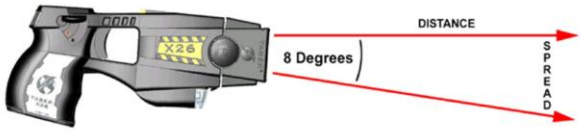
Ambidextrous Safety

- Safety Switch Down
  - (SAFE)
- Safety Switch Up
  - (ARMED)
  - Activates CID and selected illumination



TASER Cartridge Probe Spread For 15, 21 & 25 Foot Cartridges

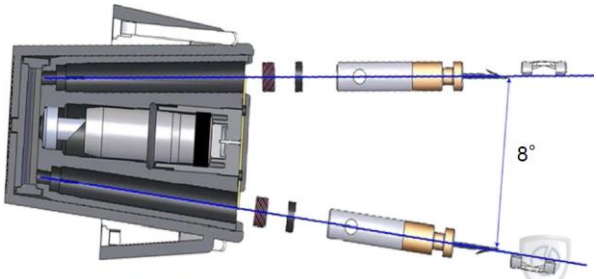
- Rule of thumb: ~1 foot (.3 m) spread for every 7 feet (2.1 m) of travel



(m)	.6m	1.5m	2.1m	3m	4.5m	6.4m	7.6m
Target Distance (ft)	2'	5'	7'	10'	15'	21'	25'
Spread (in)	4"	9"	13"	18"	26"	36"	38"
(cm)	10cm	23cm	33cm	46cm	66cm	91cm	109cm

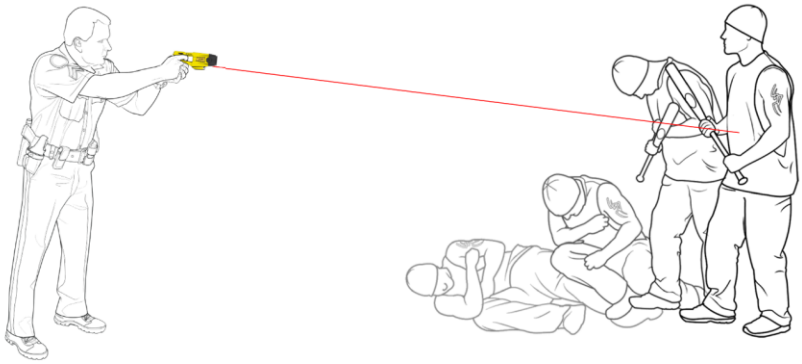
15, 21, LS & XP25 TASER Cartridges

The top probe is "horizontal" relative to CEW



Bottom probe 8-degrees down

TASER

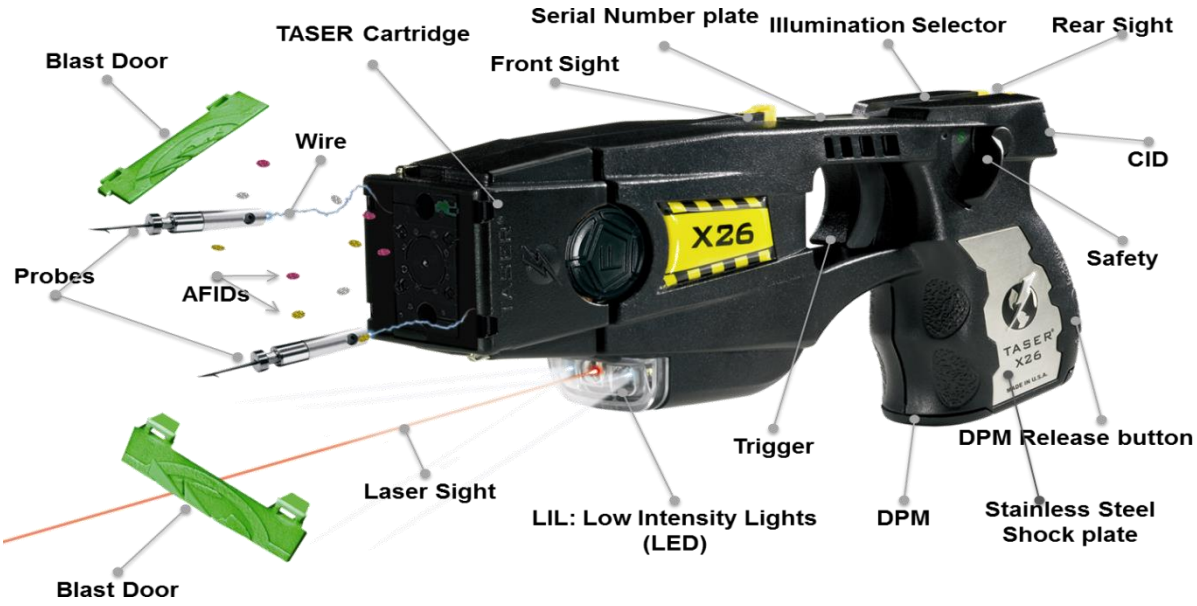


2. **The differences between TASER CEW modes. Why one TASER CEW mode or the another might be preferred by a law enforcement officer (LEO) under certain circumstances[17]**

TASER X26(E) CEW Basics:

The below graphic shows the basic components of the X26(E) CEW.[18]

Figure 1 Basic TASER X26(E) CEW Components.

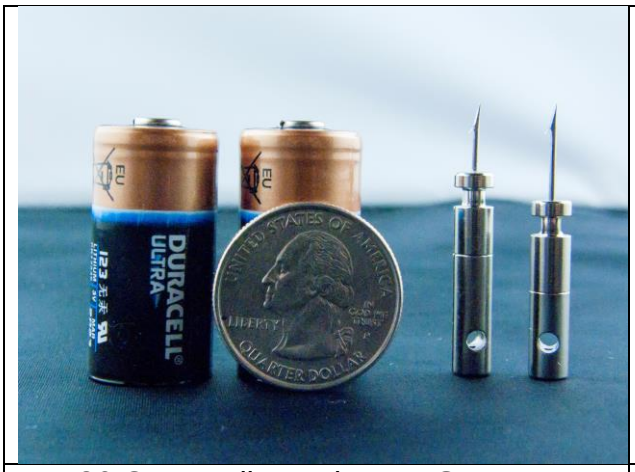
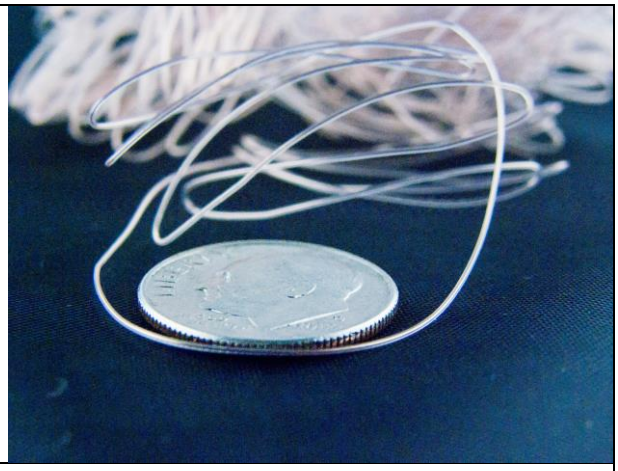


TASER X26(E) CEW Delivers a Very Small Electrical Charge:

The TASER X26(E) CEW is powered by a battery of two Duracell® CR123 three-volt (V) cells. This battery is the same as used in some small flashlights and cameras (such as the Nikon® F6.) In an X26 CEW this battery is expected to last a couple of years and to discharge 195+ 5-second discharges totaling 18,525+ very short duration (≈ 100 microseconds (µs), very small charge (≈ 100 microcoulombs (µC)), pulses. The cartridge wire is 127 microns (millionths of a meter) in diameter and smaller than some human hair.

[17] An Introduction to TASER® Electronic Control Devices, History, Electricity, Electrical Stimulation, Electrical Measurements, and the Human Body: includes: An Introduction to TASER Electronic Control Devices; History; Electricity Basics; Electrical stimulation; Electrical measurements, and The human body.

[18] TASER Training Version 15, released August 2009, User PowerPoint, Slide 27. Same slide in other TASER Training Versions.

	
X26 CEW cells, probes, U.S. quarter	X26 CEW cells and U.S. quarter
	
13 millimeter dart CEW probe and dime	CEW wire and dime
	
9 millimeter dart CEW probe and dime	

Necessity of Completed Circuit to Deliver an Electrical Charge:

In order for a CEW to deliver an electrical charge to a person it is necessary that the CEW have a completed circuit capable of delivering, and then maintaining, the charge (see Figure below).

Figure 2 Necessity of Completed Intact Electrical Circuit to Deliver Charge

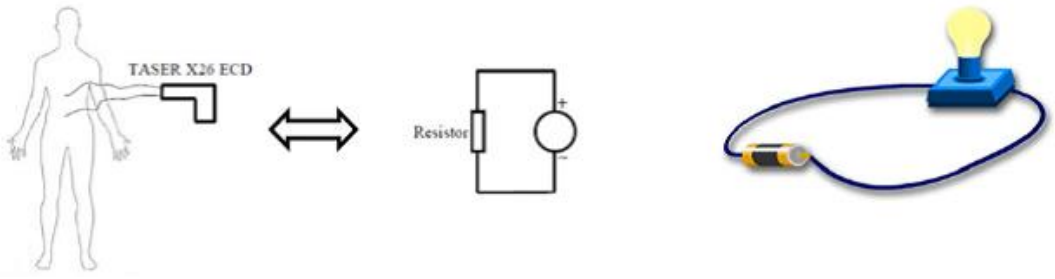
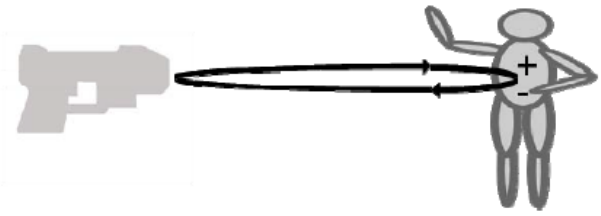


Figure 3 (NY) Illustration of Circular Current Flow to Complete Electrical Circuit.[19]

In order for electricity to have an effect, it must flow in a circular pattern between a positive and negative conductor to complete a circuit.



There are three (3) basic modes of TASER CEW deployment: (1) drive stun, (2) probe mode, and (3) three-four-point deployment mode.

[19] Conducted Energy Device Course, Student Guide, Municipal Police Training Council, New York State Division of Criminal Justice Services, Office of Public Safety, State of New York, December 2009. Pg. 2.6.

CEW Drive-Stun Mode:

M26/X26/X26(P) CEW Drive-Stun Mode:

Figure 4 Arrows Pointing to Electrodes on Front of CEW with No Expended Cartridge in Place.

Figure 5 Illustrating CEW Drive-Stun Discharge Across Front Electrodes and LASER.

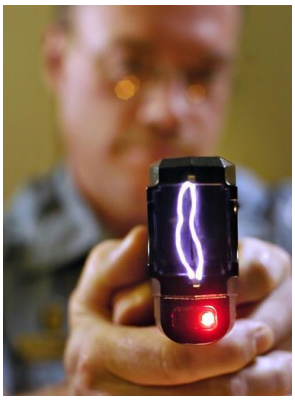


Figure 6 X26 CEW Front Electrodes – No Cartridge in Place on CEW.

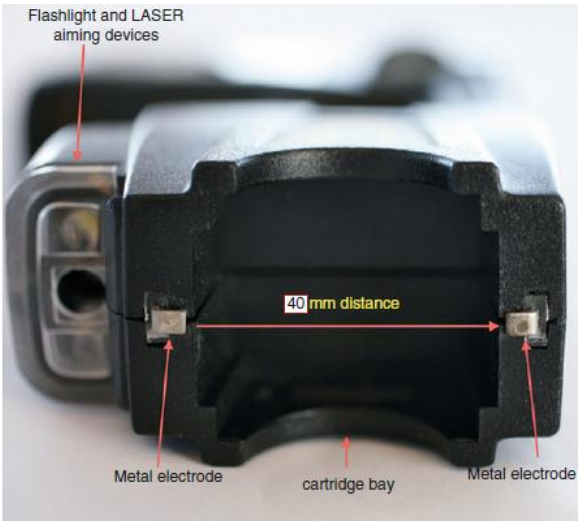
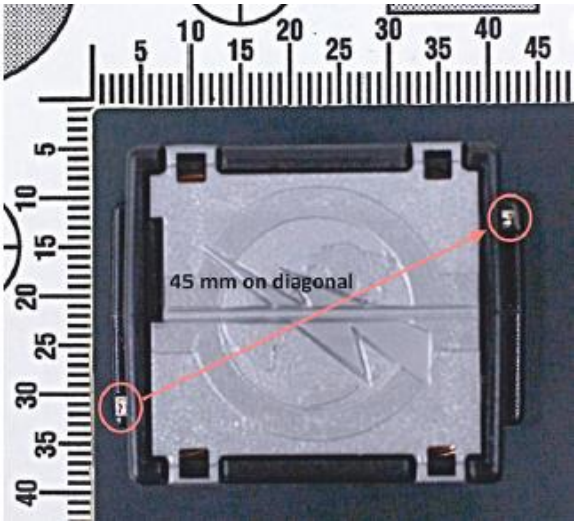


Figure 7 X26 CEW Cartridge Showing Front Electrodes Recessed on Cartridge.



Drive stun mode means that the CEW is pressed directly against, or in very close proximity to, the subject and delivers an electrical charge from the two (2) exposed fixed electrodes. There are two (2) exposed electrodes on the front of the CEW (See Figures above), and there are also two (2) exposed electrodes on the front of an expended (previously deployed) CEW cartridge remaining affixed to the CEW.

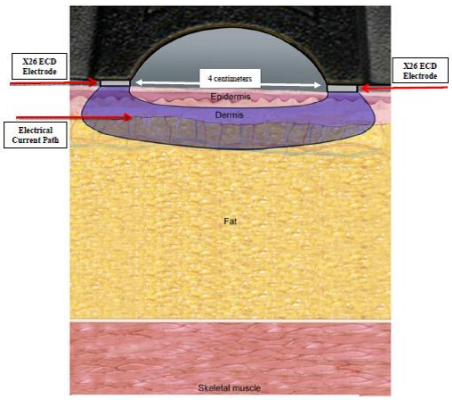
CEW Drive-Stun Path-of-Current Demonstrations:

A couple of easy, and clear, demonstrations of drive-stun mode, completed circuit, flow of electrical charge (taking path of lowest resistances) include, but are not limited to: (1) while wearing a metal watch band simply arcing the front electrodes on the CEW across the metal watch band (there is no electrical charge delivered to the demonstrator and no pain or other ill effects); and (2) while holding a 12 ounce soda can (either full or empty, does not matter) arcing the electrical charge between the electrodes and the soda can (same effect as metal watch band).[20] Similar demonstrations can be shown with CEW in probe mode.

CEW Drive-Stun Mode: Pain Compliance:

CEW in drive-stun mode "becomes a pain compliance tool with limited threat reduction."[21] The CEW drive-stun mode graphic [Figure below] illustration depicting path and depth of delivered electrical charge based upon finite-element modeling. [Graphic was mentioned in *Glowczenski v. TASER International, Inc.*, 2012 WL 976050, 2012 U.S. Dist. Lexis 39438 (E.D.N.Y. March 22, 2012). "After viewing an exhibit showing the flow of electrical charge from a T[ASER CEW] in drive stun mode, which showed that the [electrical] charge does not penetrate the dermal fat layer into the skeletal muscle of the recipient, and which [Dr. William] Manion [forensic pathologist and attorney] agreed was a "fair representation," ..." *Id.* pg. 14.][22]

Figure 8. CEW Drive-Stun Mode Flow of Electrical Charge Graphic.



In *Hoyt v. Cooks*, the Circuit Court of Appeals for the Eleventh Circuit stated, "[t]he [TASER CEW] was classified as an electro-muscular disruptor when used to fire

[20] See my full list of electronic weapons demonstrations outline for additional demonstrations and greater depth of how to perform the various visuals and demonstrations.

[21] *Abbott v. Sangamon County, Ill.*, 705 F.3d 706 (7th Cir.(Ill.) Jan 29, 2013).

[22] I retained the graphic designer to create the graphic, directed the creation and content of the graphic, collaborated with bioelectrical scientist and finite element modeling expert on current flow, and coordinated peer-review, I authorized payment of the graphic, deposed Dr. William Manion (including with regard to the graphic), and presented the graphic as an exhibit to Dr. Manion's deposition.

small probes attached to the weapon with thin wires because, in that mode, it overrides the central nervous system and makes muscle control impossible. The TASER [CEW] can also be used as a pain compliance weapon in what is called the "drive stun" mode. In the "drive stun" mode, the weapon is pressed against a person's body and the trigger is pulled resulting in pain (a burning sensation) but the "drive stun" mode does not disrupt muscle control.[23] "[T]he record in this case reveals a stark contrast between the prong mode (which overrides the central nervous system and disrupts muscle control) and the much less serious [drive] stun mode (which results merely in pain, a burning sensation)."[24]

In *De Boise*[25] the United States Court of Appeals for the Eighth Circuit stated "Deploying the taser in drive stun mode means that an officer removes the cartridge from the taser and applies the taser so as to make direct contact with the subject's body. When the taser is in drive stun mode, it only causes discomfort and does not incapacitate the subject."

On October 15, 2013, the Council of Canadian Academies and Canadian Academy of Health Sciences[26], with regard to CEW drive stun mode, stated:

> "In drive stun mode, the device is pressed directly against the subject, causing localized pain."[27]
>
> "In drive stun (also known as touch stun) mode, the device is pressed directly against the subject like a traditional stun gun. The electrical current is delivered across a more localized area than in a probe mode deployment (NSDOJ, 2008a). As a result, the main effect of drive stun mode is localized pain, and muscle immobilization is likely to be localized, due primarily to direct stimulation of skeletal muscle fibres adjacent to the point of contact with the electrodes."[28]

The National Institute of Justice (NIJ), United States (U.S.) Department of Justice (DoJ) five (5) year ECD study report included: "in the drive-stun mode of CEDs … the density of the current in the tissue is much lower in this mode."[29] The May 2011 NIJ report also included:

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[23] *Hoyt v. Cooks*, 672 F.3d 972, 976 (C.A.11 (Ga.) Feb. 27, 2012).
[24] *Hoyt v. Cooks*, 672 F.3d 972, 976, fn 5 (C.A.11 (Ga.) Feb. 27, 2012).
[25] *De Boise v. Taser Intern., Inc.*, *760 F.3d 892*, fn 5 (C.A.8 (Mo.) Jul 28, 2014), *cert. denied* (May 26, 2015).
[26] Council of Canadian Academies and Canadian Academy of Health Sciences, 2013. The Health Effects of Conducted Energy Weapons. Ottawa (ON): The Expert Panel on the Medical and Physiological Impacts of Conducted Energy Weapons Council of Canadian Academies and Canadian Academy of Health Sciences.
[27] *Id.*, page viii.
[28] *Id.*, page 25.
[29] (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011, pg. 10.

"**Conclusions and Recommendations:** The "drive-stun" or contact mode of CED use is a pain compliance procedure, and does not cause muscular incapacitation enabling restraint. …"[30]

The May 2011 Pasquier CEW review paper[31] included:

"The [CEW] can also be used as a contact device whereby the darts are not fired, but rather the 2 metal darts make direct contact with a person's body, in what police call a "drive stun." With this method, the shock is delivered directly to the subject and the main effect is therefore not neuromuscular incapacitation, but a painful stimulus."

In the June 2011, the American Academy of Emergency Medicine (AAEM) CEW Position Paper[32], stated:

"**Recommendation 3:** Evaluation after Use of CEW in Drive Stun or Touch Stun Mode Level of recommendation: Class B. For patients who have undergone drive stun or touch stun CEW exposure, medical screening should focus on local skin effects at the exposure site, which may include local skin irritation or minor contact. This recommendation is based on a literature review in which thousands of volunteers and individuals in police custody have had drive stun CEWs used with no untoward effects beyond local skin effects."

"Conclusions ... Among patients who had a CEW activation in drive stun or touch stun mode, evaluation should focus on skin manifestations, which are typically limited to surface, also called signature marks."

The Circuit Court of Appeals for the Ninth Circuit *en banc* decision of *Mattos v. Agarano*, 661 F.3d 433 (C.A.9 (Hawaii) Oct. 17, 2011) (that included the *Brooks v. Seattle* case) included:

"When a [TASER X26 CEW] is used in drive stun mode, the operator removes the dart cartridge and pushes two electrode contacts located on the front of the [TASER CEW] directly against the victim. In this mode, the [CEW] delivers an electric shock to the victim, but it does not cause an

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[30] (05/2011 NIJ) Five (5) year NIJ study: Laub, J., Study of Deaths Following Electro Muscular Disruption, National Institute of Justice, May 2011, pg. 22.

[31] Pasquier, M., Electronic Control Device Exposure- A Review of Morbidity and Mortality, *Annals of Emergency Medicine*, May 2011.

[32] Vilke GM, Bozeman WP, Chan TC. Emergency Department Evaluation after Conducted Energy Weapon Use: Review of the Literature for the Clinician. *J Emerg Med*. May 2011;40(5):598-604. Position Paper Approved by the American Academy of Emergency Medicine Clinical Guidelines Committee.

override of the victim's central nervous system as it does in dart-mode."[33]

The CEW only delivers electrical charge to the person when it is in very close contact with the skin or clothing. As the *Glowczenski* Court included:

> "According to [TASER], each ECD trigger pull activates a 5 second cycle, but when in drive stun mode, it delivers an electrical charge only for the time that it is in direct contact with the skin."[34]

The CEW applied in drive stun mode can bounce around and can move in and out of contact with the subject. In the *Lomax* case, the Court stated:

> "When applied in drive-stun mode, the ECD does not typically remain in contact with the subject during the entire duration of the discharge due to the subject already struggling against the officers and his reaction to the ECD, causing it to bounce in and out of contact with him."[35]

In *Green v. Garris* the Court stated:

> "In Green's case, the electrodes skipped along the skin-causing the [TASER CEW] to come in contact with the body more than once during the same drive stun. The contact marks shown in the photographs attached to Green's complaint are consistently normal with the use of a [TASER CEW] in the drive stun mode. Often an officer does not have a choice in the location of the electrodes' contact with the attacker's body."[36]

Drive-stun mode becomes a pain compliance tool with limited threat reduction. The effects of CEW in drive stun mode are almost exclusively limited to the area of the CEW electrodes on the front of the CEW; which are 4 centimeters (cm) (or 1.6 inches) apart. The electricity flows between the electrodes and does not penetrate below the sub-dermal fat layer (as shown in graphic illustration above). Thus, drive-stun mode has localized effects limited to the immediate area of the drive-stun application. Drive stun does not cause full-body pain, neuromuscular incapacitation (NMI), falling, or loss of volitional motor control.

The Municipal Police Training Council, New York State Division of Criminal Justice Services, Office of Public Safety, State of New York, defines CEW drive-stun mode as "Direct contact mode – CED is held against a subject's body causing the electrodes

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[33] *Mattos v. Agarano*, 661 F.3d 433, 443 (C.A.9 (Hawaii) Oct. 17, 2011)
[34] *Glowczenski v. TASER International, Inc.*, 2012 WL 976050, 2012 U.S. Dist. Lexis 39438 (E.D.N.Y. March 22, 2012).
[35] *Neal-Lomax v. Las Vegas Metro. Police Dept.*, 574 F. Supp. 2d 1170, 1176 (D. Nev. 2008) *aff'd*, 371 F. App'x 752 (9th Cir. 2010).
[36] *Green v. Garris*, 2008 WL 2222321, 2008 U.S. Dist. LEXIS 42302, *27 (M.D. Fla. 2008).

located at the end of the CED to come into contact against a subject."[37] They also state:

> "Officers should be mindful that direct contact mode creates pain compliance only and may not stop a subject from struggling with an officer and pulling away from the electrodes as the officer attempts to apply the CED in direct contact mode. As a result of the struggle, multiple contact marks may be left on a subject's skin indicative of multiple cycles being applied by an officer as he/she attempts to subdue subject. Downloaded data should be checked to verify the actual number of cycles used during the incident."[38]

The International Association of Chiefs of Police (IACP) April 2010 Electronic Control Weapon Model Policy includes:

> IV. Procedures. C. Deployment. ... 4. The ECW may also be used in limited close range, self-defense, and pain-compliance circumstances in the "contact" mode, if there is no opportunity to use the device in the preferred "probe mode." When the device is used in "contact" mode it is: a. primarily a pain compliance tool, b. generally less effective than when probes are deployed with spread in excess of 12 inches, and c. subject to the same deployment guidelines and restrictions as probe deployments..[39]

The International Association of Chiefs of Police (IACP) Draft Model Policy dated August 2004[40] includes:

> "IV. Procedures. ... C. Deployment and Aftercare.
>
> 1. The ECW is analogous to OC spray on the use of force continuum and decisions to deploy an ECW should require the same basic justification. However, when determining whether to use OC spray or an ECW, the totality of the circumstances should be considered together with the following factors specific to these two weapons:
>
> (a) The likelihood of physical injury resulting from an ECW is similar to OC spray with the exception of accidental probe contact to a vital area or a secondary injury to the subject from falling.

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[37] Recommended Guidelines for the Use of Conducted Energy Devices, Municipal Police Training Council, New York State Division of Criminal Justice Services, Office of Public Safety, State of New York, September 2009. Pg. 1.

[38] Recommended Guidelines for the Use of Conducted Energy Devices, Municipal Police Training Council, New York State Division of Criminal Justice Services, Office of Public Safety, State of New York, September 2009. Pg. 6.

[39] (2010) Electronic Control Weapons, Model Policy, April 2010, International Association of Chiefs of Police.

[40] (Emphasis added). Electronic Control Weapons, Model Policy Draft, International Association of Chiefs of Police (IACP), National Law Enforcement Policy Center, August 2004. See also, (2004 IACP) IACP Training Key #575. Electronic Control Weapons: Update. 2004.

(b) OC spray creates more discomfort to subjects than ECWs but is less incapacitating.
(c) Persons exposed to ECWs recover rapidly as compared to far longer recovery periods for OC spray and the potential for cross contamination resulting from the spray.

…

4. The device may also be used in exigent circumstances in a "touch stun" mode. The cartridge is removed and the unit is pressed firmly into an appropriate area such as the abdominal region, hips, thigh, the brachial plexus origin on the side of the neck, and the pelvic girdle.

Selected Additional Selected CEW Studies:

1. (10/2013 Hall) Hall, C. 2013. RESTRAINT. 2013. Canadian Police Research Centre, Canadian Safety and Security Program, Government of Canada. October 2013.

    a. "Of the 745 CEW deployments, the mode of deployment was recorded in 565. Of those, 103 did not include actual current activation but consisted of display of the laser light sighting only. In the remaining 462 actual activations of the device(s), 336 included the use of CEW probes and 126 included contact stun deployments. When CEW was used in any fashion it was used alone in just under half of the events (44.7%). In the remaining 55.3% of CEW deployments, CEW was used in conjunction with another restraint modality." (emphasis added) Pages 2-3.

2. (07/2010 Ho) Ho, J.D., Dawes, D.M., Nelson, R.S., Lundin, E.J., Ryan, F.J., Overton, K.G., Zeiders, A.J., Miner, J.R. 2010. Acidosis and Catecholamine Evaluation Following Simulated Law Enforcement "Use of Force" Encounters. Acad Emerg Med. July 2010;17(7)e60–68.

    a. Establishing that CEW use actually reduces stress markers compared to other force options and restraint alternatives).

1. (04/2008 Ho) Ho J.D., Lapine A, Joing S, Reardon R, Dawes D. 2008. Confirmation of Respiration during Trapezial Conducted Electrical Weapon Application. Acad Emerg Med. Apr 2008;15(4):398.

    a. CEW drive-stun applications have no effect over human phrenic nerves—nerves that control breathing.

2. (01/2008 Ho) Ho, J., Dawes, D., Lapine, A., et al. 2008. Prolonged TASER® "Drive Stun" Exposure in Humans Does Not Cause Worrisome Biomarker Changes [POSTER]. Hennepin County Medical Center. National Association of EMS Physicians. 2008.

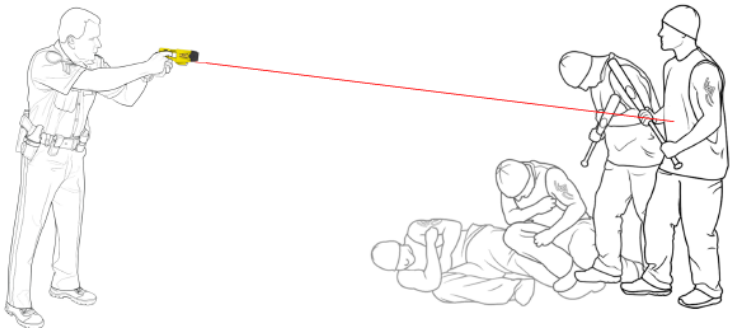
    a. No medically worrisome changes in human physiology found from two consecutive 5 second drive-stuns or one continuous 15 second drive-stun.

CEW Probe Deployment Mode:

In probe deployment mode there is a live (not previously expended) cartridge on the front of the CEW. When the CEW trigger is pulled two (2) probes are propelled from the cartridge with trailing wires to the target. The probes and the wires attached to the cartridge on the CEW are designed to create and maintain the electrical circuit to the subject.

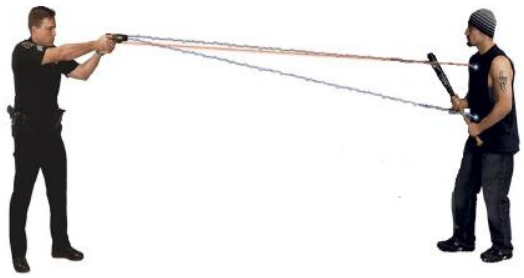
The Municipal Police Training Council, New York State Division of Criminal Justice Services, Office of Public Safety, State of New York, defines CEW probe-stun mode as "Probe mode – CED propels two probes which are connected to a main unit by a conductive wire."[41]

Figure 9 Pre-Probe Deployment Mode LASER Aiming Illustration (appropriately targeting lower center mass).



[41] *Recommended Guidelines for the Use of Conducted Energy Devices, Municipal Police Training Council, New York State Division of Criminal Justice Services, Office of Public Safety, State of New York, September 2009. Pg. 1.*

Figure 10 Prior CEW Probe Deployment Mode Showing Completed Electrical Circuit (targeting chest).



The probes are expended (deployed) from the cartridge and travel at an eight-degree (8º) downward angle. Thus, for each seven feet (7') of distance from the front of the CEW cartridge to the subject impact points the probes will separate approximately one foot (1') (see Figure below).

Probe deployment mode is designed to induce neuromuscular incapacitation (NMI). NMI "… by all measures [is] … a function of spread; generally increasing in effectiveness up to spreads between 9 and 12 in. There [are] notable differences between front and back exposures, with front exposures not leading to full incapacitation of the upper extremities regardless of probe spread."[42] Researchers have determined that ECD-induced "[m]uscle-contraction force increased as the spacing increased from 5 to 20 [centimeters (cm)], with no further change in force above 20 cm of spacing."[43]

Table 1 TASER X26(E) Cartridges (from V19 CEW User PP)

Cartridges	Cartridges
• TASER cartridges are used in the X26, X26P, M26 and SHOCKWAVE CEWs – Available in 15, 21, 25 and 35 ft* • All TASER cartridges have a 5 year expiration from date of manufacture TASER cartridges are deployed by electrical arc. Discharging CEW, static electricity, or other electrical source can cause inadvertent cartridge deployment.	 15 ft. (4.6 meters) Yellow blast doors Live cartridge Regular probe 21 ft (6.4 meters) Silver blast doors Live cartridge Regular probe XP 25 ft. (7.6 meters) Green blast doors Live cartridge XP probe XP 35 ft Special Duty (10.67 meters) Orange door Live cartridge XP probe

[42] Ho J, Dawes D, Miner, J, Kunz S, Nelson R, Sweeney J. Conducted electrical weapon incapacitation during a goal-directed task as a function of probe spread. *Forensic Sci Med Pathol*. Apr 2012.

[43] Beason C, Jauchem J, Clark C, Parker JE, Fines DA. Pulse Variations of a Conducted Energy Weapon (Similar to the TASER X26 Device): Effects on Muscle Contraction and Threshold for Ventricular Fibrillation*. *J Forensic Sci*. Sep 2009;54(5):1113-1118.

Figure 11 M26/X26/X26(P) CEW Cartridge Showing Probe Discharge and 8º Discharge Downward Angle.[44]

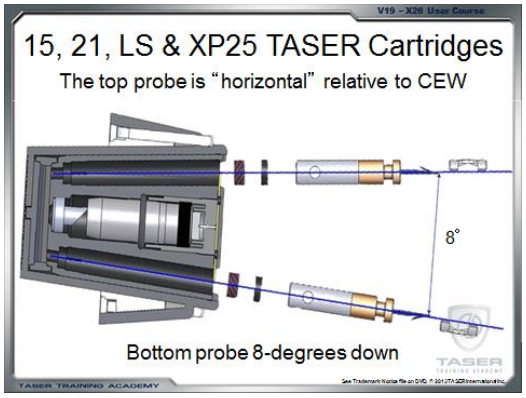
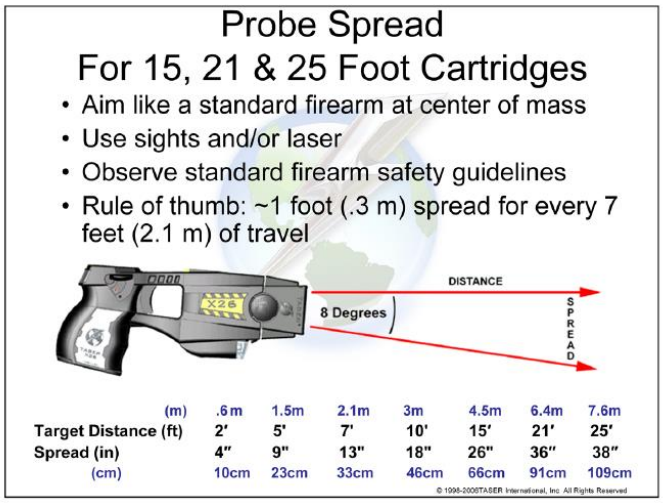


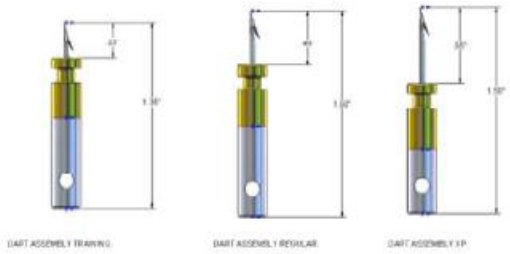
Figure 12 M26/X26/X26(P) CEW Probe-Deployment Distance to Subject Probe Spread.



[44] TASER Training Version 19 X26 User PowerPoint, Slide 115. Same slide in earlier training versions.

CEW Probes, Subject Targeting, and Probe Placement

Table 2 Subject targeting PP slides from Training V 19 X26(E) CEW User PP

	**Probe Placement** (Does not apply to 35 ft cartridges) • Deployment range from point blank to 15, 21, or 25 feet depending on cartridge • Preferred range = 7 to 15 feet from target for probe spread, officer safety, and accuracy
Deployment Distance Considerations Deployments from 0-7 feet (0-2 meters): • Higher hit probability • Limited probe spread = low amount of muscle mass affected • Short reactionary distance 	**Deployment Distance Considerations** Deployments from 0-7 feet (0-2 meters): • Consider targeting the waist area to "split the belt line": – Affect core muscles needed for balance • Avoid probes near the heart or in chest: – Low probability of NMI – Increases dart-to-heart safety distance 
Deployment Distance Considerations Deployments from 7-15 feet (2-4.5 meters): • Higher hit probability • Good probe spread = good amount of muscle affected • Slack in wires (with 21 or 25 foot cartridges • Good reactionary distance	**Deployment Distance Considerations** Deployments from 15 – 25 feet (4.5 – 7.6 m): • May be out of range of 15/21' cartridges • Fair hit probability with both probes • Large probe spread = large amount of muscle affected • Less slack in wires • Larger reactionary distance

Anti-Felon Identification Tags (AFIDs)

Figure 13 AFIDs PP slide from Training V 19 X26(E) CEW User PowerPoint

AFID is an acronym for Anti-Felon Identification. When a TASER cartridge or a Smart cartridge is deployed, 20-30 identification tags called AFIDs are dispersed. The AFIDs are printed with the serial number of the cartridge they are deployed from and help in determining the purchaser of the cartridge. The AFIDs were originally created for civilian sales of TASER CEWs to deter criminal use. As an offshoot of this, many law enforcement agencies collect AFID tags at the scene of a deployment to determine the number of cartridges deployed and who deployed them. This helps to prevent abuse and protects officers from unfounded allegations through documentation of use.

IACP Authorized Use of CEW in Probe Mode

The International Association of Chiefs of Police (IACP) April 2010 Electronic Control Weapon Model Policy includes:

> IV. Procedures. C. Deployment. 1. **T**he ECW is generally authorized to be used in circumstances where grounds to arrest or detain are present and the subject's actions cause a reasonable officer to believe that physical force will be used by the subject to resist the arrest or detention. Such actions may include but are not limited to: a. use of force against the officer or another person; b. violent, threatening, or potentially violent behavior; c. physically resisting the arrest or detention; d. flight in order to avoid arrest or detention, in circumstances where officers would pursue on foot and physically effect the arrest or detention; e. self-destructive behavior. 2. The ECW is most effective at overcoming resistance and assisting officers with subject control when used in the "probe mode," which is the preferred deployment technique when practical.[45]

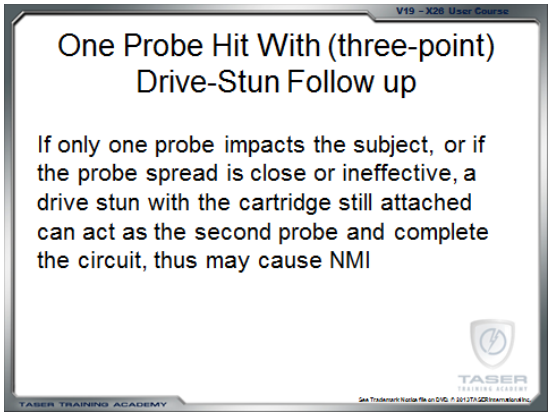
[45] (2010) Electronic Control Weapons, Model Policy, April 2010, International Association of Chiefs of Police.

Three-Point (and Four-Point) CEW Deployment Mode:

CEW three-point (and four-point) deployment mode is utilized to attempt to gain NMI when for whatever reason a deployed probe mode is not succeeding in achieving the desired NMI effect. Three-point (and four-point) deployment is a combination of use of the CEW in both probe-deployment mode followed up by a simultaneous drive stun. Use of the CEW in three-point (and four-point) deployment mode is intended to create a wide electrode spread or separation in order to significantly increase the probability of achieving NMI. If the probe did not make contact, the third point of contact would not result in NMI. If the probe is not sufficiently close to the subject to complete the circuit, the third point of contact is ineffective and the CEW reverts to a pain compliance tool.

Research has shown that "[n]umerical modeling estimated that TASER CEWs were expected to be safe when deployed in 3-point mode. In drive-stun, probe-mode or 3-point deployments, the CEWs had high theoretically approximated safety margins for cardiac capture, VF, phrenic or vagus nerve capture and skeletal muscle damage by electroporation."[46]

Figure 14 Three-Point CEW Deployment TASER Training Version 19 User PowerPoint Slide 197.

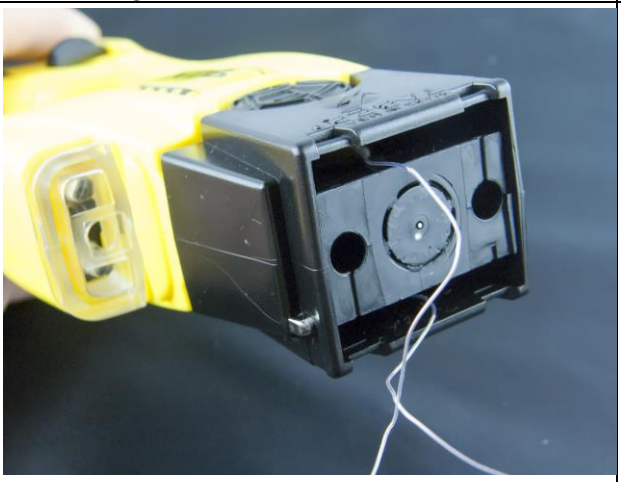
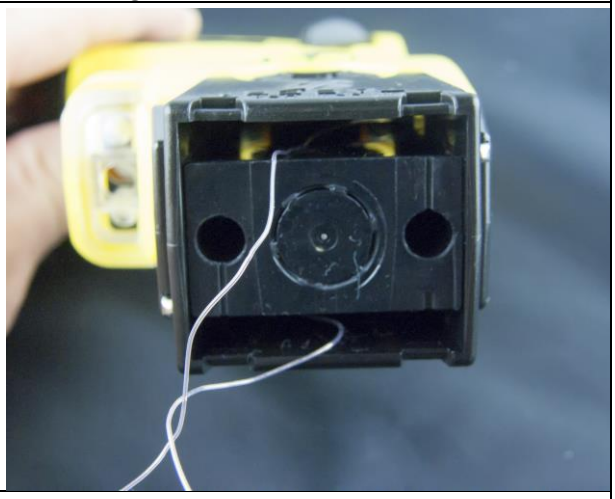


The International Association of Chiefs of Police (IACP) April 2010 Electronic Control Weapon Model Policy includes:

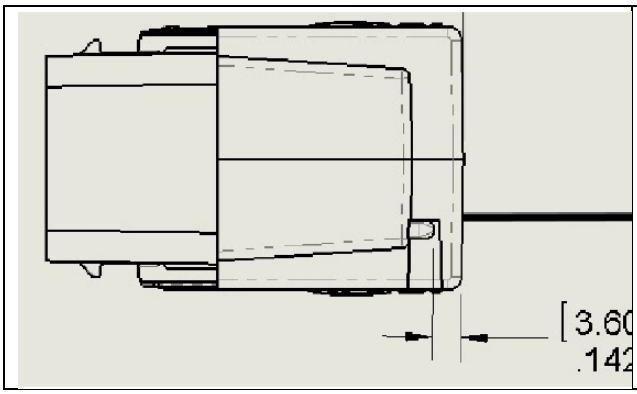
> IV. Procedures. C. Deployment. … 5. An alternative method of close-range deployment involves firing the ECW cartridge at close range, then applying the ECW in "contact" mode to an alternate part of the body. This creates a "probe spread" effect between the impact location of the probes and the point where the ECW is placed in contact with the subject's body, resulting in an increased probability of subject control as compared to the standard

[46] Panescu D, Kroll M, Stratbucker R. Medical safety of TASER conducted energy weapon in a hybrid 3-point deployment mode. Conf Proc IEEE Eng Med Biol Soc. 2009;1:3191-3194.

"contact" mode. When the ECW is used in this manner, it is: a. potentially as effective at subject control as a conventional cartridge-type probe spread deployment, and b. subject to the same deployment guidelines and restrictions as any other ECW cartridge deployment.[47]

X26 CEW with no cartridge attached	X26 with Silver door cartridge attached
	
X26 CEW with expended cartridge showing rounded, recessed electrodes	X26 CEW with expended cartridge showing rounded, recessed electrodes
	
X26/X26(P) CEW Cartridge showing rounded, recessed electrodes	

[47] Electronic Control Weapons, Model Policy, April 2010, International Association of Chiefs of Police.



3. **Peak voltage, peak current and power have no bearing on effectiveness or medical safety, and any measurement of these parameters is purely academic.**[48]

4. **For a TASER X26 CEW the peak voltage is irrelevant and another red-herring.**[49]

   a. **VOLTAGE**[50] ***(measured in "volts" and symbolized by "V")*****: a**lso called electromotive force, is the pressure behind the flow of electrons. It is important to note that high voltage in and of itself is not necessarily dangerous. A strong static electricity shock can be in excess of 30,000 volts (V) and a Van de Graff generator that many children have experienced in science classes or museums can generate up to 25,000,000 V.

      In a water analogy, voltage would be the pressure measured in pounds per square inch. Voltage can also be analogized to height – from how high does the water fall? The higher a waterfall or rain from the sky, the greater the pressure with which the water hits the ground. Voltage is measured in volts (one volt is the amount of force required to send one ampere (A) of current through a resistance of one ohm (Ω).

      50,000 volts do not enter the body

      Even though the TASER X26 CEW has a 50,000 peak open circuit arcing voltage to jump the air gap, the 50,000 V is not delivered to a person's body. The X26 CEW has an average (one-second baseline) voltage of about 1 V, with a peak

[48] Magne Nerheim, Vice President, Research and Development, TASER International, Inc., Memo: Customer testing of TASER X26 and Advanced TASER M26, dated January 19, 2009. Page 2.

[49] Also see, Brief Introduction to TASER® Electronic Control Devices, History, Electricity, Electrical Stimulation, Electrical Measurements, and the Human Body dated July 14, 2012.

[50] Voltage, expressed in volts (V), (often referred to as electric or electrical tension) is the difference of electrical potential between two points of an electrical or electronic circuit. Voltage measures the potential energy of an electric field to cause an electric current in an electrical conductor. Depending on the difference of electrical potential the voltage may be called extra low voltage, low voltage, high voltage, or extra high voltage.

loaded voltage of 1,900 V, and a 600 V average over the duration of the pulse.

It is not the volts, it is the delivered electrical charge that is most important

A TASER CEW generates a high (peak open circuit) voltage. Voltage is not generally a key measure of electrical safety. While voltage indicates the pressure behind a flow of electrons and how far that electric current will arc through the air, voltage is generally not a key indicator of safety or effectiveness when it comes to stimulating the human body. The key indicator for safety and effectiveness is the number of electrons delivered into the body – *i.e.* the delivered electric current (A) over time, or the total electric charge (C) in very short duration discrete pulses, and not the high open circuit peak voltage.

Examples of Experiencing up to 20 Million V from a Van de Graff Generator

To demonstrate this principle, note the above, a picture of a mother and daughter, and another of a young girl, happily experiencing millions of volts from a Van de Graff Generator at a science museum. This Van de Graff generator creates very high voltage, but nearly zero electric current. Accordingly, while the static forces associated with the high voltage cause their hair to stand on end, they feel no sensation or ill effects because virtually no electric current flows.

The X26 CEW has a mean voltage per pulse was 580.1 volts (V), with an average peak main phase voltage of 1899.2 V.[51]

5. **For a TASER X26 CEW the peak current per pulse is irrelevant and another red-herring.**[52] [53]

[51] Dawes DM, Ho JD, Kroll MW, Miner JR. Electrical Characteristics of an Electronic Control Device Under a Physiologic Load: A Brief Report. *Pacing Clin Electrophysiol*. Mar 2010;33(3):330-6.

[52] Also see, Declaration pursuant to 28 U.S.C. §1746 of J. Patrick Reilly, dated May 25, 2011, Rich v. TASER International, Inc., Case No: 2:09-cv-02450-ECR-RJJ, United States District Court, District of Nevada.

[53] Also see, Brief Introduction to TASER® Electronic Control Devices, History, Electricity, Electrical Stimulation, Electrical Measurements, and the Human Body dated July 14, 2012.

a. **CURRENT *(measured in "amperes" and symbolized by "A" or "I")*: is** measured in amperes (A), measures the flow rate, how many electrons flow each second. The ampere (A) is the International System of Units (SI) base unit of electric current or amount of electric charge per second (s). One ampere (A) is the flow of 1 coulomb (C) of electrons in 1 second (s).

   The X26 CEW has a mean current per pulse was 0.97 amperes (A) and average peak main phase current of approximately 3.10 A.[54] The X26 CEW has an average, aggregate, or actual current of approximately 0.0019 A or 0.0015 - 0.0026 A.

b. **CHARGE *(measured in "coulombs" and symbolized by "C")*:** is the total number of electrons moved over a given period of time. A coulomb (C) is the SI derived unit of electric charge. One coulomb is equal to $6.24150962915265 \times 10^{18}$, or approximately 6.24 quintillion, electrons or elementary charges. One C is the amount of electric charge transported by a current of 1 A in 1 s.

   The water analogy would be the water flow rate measured in gallons per second. Electric current is measured in amperes (A). One ampere (A) is equal to a flow rate of 1 coulomb (C) (approximately 6,240,000,000,000,000,000 electrons) per second (s). While the number of electrons in a coulomb is a very large number, it is approximately equivalent to the number of water molecules in two (2) drops of water. In the water analogy, electric charge, measured in C, would be the total amount of water that has flowed, measured in gallons.

   The X26 CEW has a main phase charge or 80–125 microcoulombs (µC) per pulse.

   TASER CEW current does not last long enough to create a substantial risk of Affecting the Human Heart

   Consider static electricity. Everyone has received at least one strong static electricity shock in their lifetime. The typical electric current pathway is from a doorknob through a fingertip and then through the chest and down through the legs to the floor. The shock can be painful and cause a significant muscle twitch, but it has never been documented in the published peer-reviewed literature to have caused a cardiac arrhythmia, much less a death. A search of over a century of medical, scientific, and electrical literature shows only one case of a static shock possibly affecting the heart – and that individual claimed he was ***cured*** of atrial fibrillation (a fairly benign chronic cardiac arrhythmia) after a static shock.[55]

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[54] Dawes DM, Ho JD, Kroll MW, Miner JR. Electrical Characteristics of an Electronic Control Device Under a Physiologic Load: A Brief Report. *Pacing Clin Electrophysiol*. Mar 2010;33(3):330-6.

[55] Screnock T. "Static Electricity Stops a Recalcitrant Arrhythmia." *Ann Intern Med.* 130, no. 1 (January 5, 1999):78.

The electric current of a strong static shock would easily kill someone if it was continuous. But, it typically lasts less than a *millionth* [.0000001] of a second and is thus much too short to affect the heart.

Also, there is an international standard that sets out the electrical characteristics of a “strong static electricity” shock. This standard is necessary for many of the electrical devices we use today. Meaning, if a cellular phone, a pager, computer, a pacemaker, etc. could not withstand a “strong static electricity” shock, then each of those electrical devices would soon be damaged. Thus, the International Electrotechnical Commission (IEC) has defined a “strong static electricity” shock as having electrical characteristics of 15,000 V and 30 A peak. (International Standard IEC-61000-4-2). The importance of the strong static-shock comparison goes to the peak current and voltage with the CEW. The CEW’s peak current and voltage is significantly less than those of the strong-static shock.

The maximum average electric current output from a wall outlet is approximately 4,000 times higher current potential than the average current from a handheld, battery-powered TASER CEW.

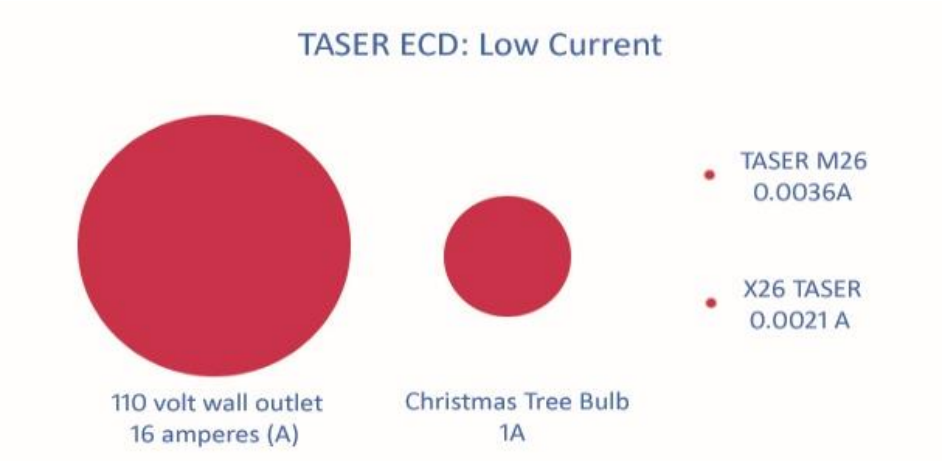

Figure 15 Average Current Comparison[56]

To appreciate TASER technology, one needs to only imagine a similar, very short shock (actually involving less peak electric current) but delivered repeatedly 15 to 25 times per second. This can immobilize a violent or resisting subject, but with very low probability of risk of negatively affecting the heart.

The TASER X26 CEW is programmed to deliver a very short electrical pulse of approximately 100 microseconds (µs) duration with about 100 microcoulombs (µC) of electrical charge at about 19 pulses per second (PPS) for 5 seconds

[56] See, *Mitchell v. City of Warren*, 803 F.3d 223 (CA6 (Mich) August 21, 2015). “When discharged, a taser fires two darts, connected to the main unit by wire, that puncture the victim’s skin and send a 0.0021–amp electrical current into the body for five seconds. (A wall outlet, by comparison, delivers 16 amps; a single Christmas-tree light bulb delivers one.).”

(s)[57]. The peak voltage delivered to the body is about 1,900 volts during the shock. The peak current of about 3 amperes is far less than that of a strong static electricity shock, which can be as high as 37.5 amperes.[58] The average, aggregate, or actual current from the X26(E) CEW is approximately 2 milliamperes (mA) (or 0.002 amperes).

6. **46% Maximal Muscle Contractions.**

   a. Even under optimal probe spread circumstances (greater than twelve inches) the CEW maximally produces 46% of muscle contractions.

   b. For the X26 CEW, optimal probe spread, to achieve maximal 46% muscle contractions, has numerous other parameters including, but not limited to: both darts embedded in the skin (penetrating the epidermis, not just clothing), broad probe spread encompassing large muscle groups (usually to the back), NMI, and others.

7. **2017/2009 Bozeman NIJ Funded Studies:**

   a. (12/2017 Bozeman) Bozeman WP, Stopyra JP, Klinger DA, et al. Injuries Associated with Police Use of Force. *The journal of trauma and acute care surgery*. 2017.

      i. A conclusion: CEW use was the force modality least likely to result in significant injury. No significant injuries occurred among 504 CEW uses (0%; 95% CI 0.0–0.9%).

      ii. There were no significant injuries after 504 CEW uses (0%; CI 0.0–0.9%) and 88 chemical weapon uses (0%; CI 0.0 – 5.0%). Unarmed physical force resulted in over one third (6/16) of the significant injuries seen in this series. These were evenly distributed among "soft" and "hard" unarmed physical force and included major head injuries and bony fractures. Unarmed physical force and CEW use were the two most common force modalities used, representing 50.8% and 36.0% respectively and 86.8% combined. Traditional intermediate force options such as pepper spray and impact weapons were not commonly used, representing 6.3% and 0.6% of force utilizations. Firearms were used in 0.4% of force utilizations (n=6 cases).

[57] This initial 5-second TASER X26(E), M26, X3, X26P, or X2 CEWs discharge can be interrupted at any time simply by the CEW operator activating the TASER CEW's safety.
[58] http://www.web-ee.com/primers/files/ESD_Tutorial.pdf

iii. The large majority of UOF cases in this series use lower levels of force such as unarmed physical force and CEWs. This reflects modern police practice in the United States as many agencies now equip some or all of their officers with CEW's. These tools have been associated with lower rates of use of other force options such as OC spray, impact weapons, and firearms, and in lower injury rates among both suspects and officers.

b. (01/2009 Bozeman) Bozeman, W.P., Hauda, W.E., Heck, J.J., Graham, D.D., Martin B.P., Winslow, J.E. 2009. Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officers Against Criminal Suspects. *Annals of Emergency Medicine*. Volume 53, Issue 4, Pages 480–489, April 2009.

i. "The primary finding that 99.75% of subjects experienced mild or no injuries represents the first assessment of the safety of this class of weapons when used by law enforcement officers in field conditions."

ii. "A rapidly evolving body of literature has examined a range of physiologic and cardiovascular effects of conducted electrical weapon exposure in human volunteers (Table 6). These studies, which include articles and published preliminary reports in abstract form, demonstrate no evidence of dangerous respiratory or metabolic effects using standard (5-second), prolonged (15-second), and extended (up to 45-second) conducted electrical weapon discharges.[14,15,22-26] Other studies of conducted electrical weapon exposure in combination with exercise designed to simulate the physiologic effects of fleeing from or struggling with police demonstrate changes in pH, lactate, and other markers comparable to that induced by exercise of the same duration.[27-31] No study has demonstrated a pathophysiologic mechanism or effect that would account for delayed deaths minutes to hours after conducted electrical weapon exposure. Findings from independent investigations have been concordant with those performed with industry support. Collectively, these data are broadly reassuring and constitute the current best understanding of the human physiologic effects of conducted electrical weapons."

FRCP 26(a)(2)(B)(i) Statement of Additional Opinions and Basis and Reasons:

The opinions listed are based on the documents and materials listed above; authoritative sources; and my education, research, experience, training, knowledge, and skill, and specialized, scientific, and technical knowledge. Each opinion does not specifically include each and every possible issue and/or each and every element of justification, and it is assumed that further narrative explanation may be provided. Each opinion must be read and analyzed as a synergistic accumulation based upon the facts and circumstances found in the above-listed documents, and that other explanations and/or justifications may be found in other parts of this document, or in the documents listed above, or were not explicitly referenced for the sake of brevity and in an attempt to confine opinions to arguably relevant issues.

Opinion Methodology: Statements/opinions provided were developed using my education, training, experience, knowledge, and literature review and case study research methodologies.

Global Overview Opinions:

1. **Not Medical Diagnosis Opinions:** Any and all references, statements, opinions, etc. related to scientific, medical, electrical, and/or engineering research are not provided as a diagnosis or for the treatment of any medical condition or person. Such statements, information, references, and opinions are from the perspectives of TASER's WARNINGS, TRAINING, how they are developed, considerations, how law enforcement officers (LEOs) are guided, etc. Such statements are made from my depth of breadth of training, experience, skill, and education, and my specialized, scientific, and technical, knowledge, including, but not limited to: PMK for CEWs, Director, Scientific and Medical Research Group, Legal Advisor to SMAB, etc.

Basic Force Opinions:

2. **Force is a Rare Event:** As officers know, and the literature finds, force is a rare event in the United States. In the USA, there are about 40 million face-to-face contacts between law enforcement and civilians annually; force was threatened or used in 1.4% of these contacts.[59] There are about 700,000 cases in which force is

[59] Eith C, Durose MR. Contacts between police and the public, 2008. Washington: U.S. Department of Justice; 2011. 27 p.

used or threatened per year.[60] Also, 75.0% of force recipients felt law enforcement officers' force was excessive.[61]

3. **Incapacitation (NMI):** As TASER training demonstrates, the use of the CEW is the force option with the greater probability of being effective.

   a. All force options, except for the CEW, achieve their use objective by the following effects:

      i. intimidation compliance (where the person is persuaded to comply by the show, presentation, or warning of impending force),

      ii. pain compliance (application of the force option resulting in pain or discomfort, which results in compliance), and/or

      iii. traumatic injury gaining compliance or preventing the subject from continuing to resist.

   b. TASER CEW with sufficient probe spread, with sufficient motor-nerve mediated muscle effect, and initiated and maintained delivery of electrical charge can cause some degree of neuromuscular incapacitation (NMI). No other law enforcement force option causes NMI.

Basic TASER CEW Opinions:

4. **Basic CEW Concepts:** The basic electrical concepts involving CEWs do not require a Ph.D. in bioelectrical engineering or bioelectrical sciences. The majority of the concepts are found in high school, in some instances middle school, sciences classes.

5. **Basic CEW Effects:** The basic effects of CEWs are taught in TASER CEW training programs, especially Master Instructor programs, and are commonly known to law enforcement officers. It does not require a Ph.D. or M.D. to understand basic effects of CEWs. Just as in my experience medical doctors are not taught about small amounts of electricity and their effects in medical school, many medical examiners or forensic pathologists have not been taught, have not researched, and do not understand the underlying basic concepts and literature related to CEWs. Few M.D.s have invested the time and resources to research the CEW-related research. I have numerous examples of this from expert reports, depositions, and trial testimony

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[60] Hickman MJ, Piquero AR, Garner JH. Toward a national estimate of police use of nonlethal force. *Criminology & Public Policy*. 2008;7(4):563-604.

[61] Eith C, Durose MR. Contacts between police and the public, 2008. Washington: U.S. Department of Justice; 2011.

involving CEWs, underlying concepts, basic electrical principles, effects of CEWs, etc., and have presented on this topic.[62]

6. **TASER's WARNINGS/TRAINING** do not create or establish a "standard of care of conduct." TASER specifically disclaims that their warnings, training, and/or other materials create a "standard of care." WARNINGS, page 1, fn 2 states:

> [2] Law enforcement agencies are force experts and are solely responsible for their own Guidance. "Guidance" includes policy, custom, procedure, rule, order, directive, training, continuum, and standard. TASER has no authority to mandate Guidance, set policy, require training, or establish standards of care or conduct.

7. WARNINGS/TRAINING are significantly different, not synonymous, with U.S. Constitutional force standards of care, or thresholds of conduct.

8. **WARNINGS are almost always not prohibitions:** The WARNINGS primarily provide information on potential elevated risks in use of CEWs. There are few, if any, prohibitions in the warnings. They are specifically intended to provide insights into increased risks due to particular uses, circumstances, etc.

9. **Effectiveness:** Some Electroshock Weapons (ESWs) are known to be up to 81% effective by presence alone, without deployment or application to a subject, including drawing, brandishing, LASER painting, arcing, etc.[63] With application to a subject, according to Mesloh[64], "in stopping confrontations in the first iteration, canines were effective 69.8% of the time, [some ESWs] were 69% effective, chemical agents were 64% effective, and takedowns were effective 41.4% of the time."[65] "[Some ESWs were] effective in 81.51% (n = 221) of the cases in the third iteration. Missed probes, baggy clothes, loose probes, broken wires, malfunctions, and the suspect grabbing the [ESW] only accounted for 5.1% (n = 14) of the [ESW] deployments at the third iteration. Despite these issues, [ESW] was still responsible for the apprehension of 271 suspects."[66]

See Outline section:

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[62] Medical Examiner Significant Errors: Case series of exceedingly rare events where very negative consequences result when investigators, medical examiners, coroners, and prosecutors fail to perform optimal investigation and fail to follow the science, logic, and avoid biases. Police Use of Force in Today's World, The Metropolitan Police Institute, Miami-Dade Public Safety Academy, June 26-27, 2017.
Brave, M., Karch, S. What Medical Examiners Should Expect When They Use the Term "Arrest-Related" Inappropriately. 2017 Forensic Science Error Management, International Forensics Symposium, National Institute of Standards and Technology (NIST), U.S. Department of Commerce and Federal Bureau of Investigation (FBI), 24-27 July 2017, NIST, Gaithersburg, Maryland.

[63] N. Grove, C. Grove, O. Peschel, and S. Kunz, "Welfare effects of substituting traditional police ballistic weapons with non-lethal alternativesWohlfahrtseffekte der Substitution traditioneller ballistischer Schusswaffen durch nichtletale Alternativen," *Rechtsmedizin*, vol. 26, no. 5, pp. 418-424, 2016.

[64] Mesloh, Wolf, Henych & Thompson, Less Lethal Weapons for Law Enforcement: A Performance-Based Analysis, Law Enforcement Executive Forum, 2008.

[65] *Id.*, at 54.

[66] *Id.*, at 63.

Thus, as Mesloh found "missed probes, baggy clothes, loose probes, broken wires, malfunctions, and the suspect grabbing the [ESW]" can cause the ESW to be less than optimally effective. Also, LEOs often have inflated expectations of what a force-option can do in field use. Meaning, the force option worked great on LEO trainees in the gym, but less effective in the dynamics of field confrontations.

10. As the literature states, as TASER training illustrates, CEWs have lower risk/probability of injury than other force options, including hands-on physical force. As officers are taught, according to the literature, TASER CEWs have lower probability of risk of suspect injury than most other force options, including hands-on physical force.[67] See my Outline sections (especially highlighted sections):

As one example, see the 2011 paper by the U.S. Centers for Disease Control that found (Outline, page 168)[68]:

[67] Also, see, TASER® Conducted Electrical Weapons (CEWs): Field Data and Risk Management (PowerPoint®), dated March 27, 2018. The most current Field Data and Risk Management PowerPoint and the most current International Field Data and Risk Management PowerPoint are both specifically included herein by reference in their entireties as though fully incorporated herein in totality, as well as all underlying foundational documents and information.

[68] Haileyesus T, Annest JL, Mercy JA, Non-fatal conductive energy device-related injuries treated in US emergency departments, 2005–2008, *Injury Prevention* (2010). doi:10.1136/ip.2010.028704.

5. (01/2011 CDC/CPSC) Haileyesus T, Annest JL, Mercy JA, Non-fatal conductive energy device-related injuries treated in US emergency departments, 2005–2008, Injury Prevention (2010). doi:10.1136/ip.2010.028704. Study funded by the National Center for Injury Prevention and Control, Centers for Disease Control and Prevention; with the assistance of the Division of Hazard and Injury Data Systems, US Consumer Product Safety Commission.

   a. "Of an average annual 75,000 suspects treated for non-fatal legal intervention injuries, 11% had injuries that were associated with the use of a CED or [TASER ECD]. ... Most suspects with CED-related injuries (93.6%) were treated and released from the hospital ED."

   b. "The estimated number of CED-related injuries treated in US hospitals increased substantially over the study period. This could be explained by the increased use of CEDs by police departments over this period and by officers following Police Executive Research Forum (PERF) guidelines to notify emergency medical service personnel and have the suspect medically evaluated after exposure to a CED discharge."

   c. Rates of injury (ROI) per 100,000 population included:

      – CED ROI 2.8 per 100,000 (95% CI was "1.4 to 4.2")
      – Physical contact w/officer ROI 17.6 per 100,000 (95% CI or 13.6 to 21.6)

   d. "The principal [CED injury] diagnoses were mostly puncture wounds (34.0%), contusions/abrasions (17.3%), foreign bodies (10.8%) and lacerations (6.8%)."

11. As TASER training demonstrates, X26(E) CEW Delivers a Very Small Electrical Charge. The X26 CEW is powered by a battery of two Duracell® CR123 3-volt (V) cells and discharges ≈ 19 pulses per second (PPS) with each pulse of very short duration (≈ 100 microseconds (µs)) and very small charge (≈ 100 microcoulombs (µC)). The cartridge wire is 127 microns (millionths of a meter) in diameter and smaller than some human hair. X26 CEW peak voltage, current and power have no bearing on effectiveness or safety, and any measurement of these parameters is purely academic[69,70]. The X26 CEW has a mean voltage per pulse of 580.1 volts (V), with an average peak main phase voltage of 1899.2 V.[71]

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[69] Magne Nerheim, Vice President, Research and Development, TASER International, Inc., Memo: Customer testing of TASER X26 and Advanced TASER M26, dated January 19, 2009. Page 2.
[70] Also see, Brief Introduction to TASER® Electronic Control Devices, History, Electricity, Electrical Stimulation, Electrical Measurements, and the Human Body dated July 14, 2012.
[71] Dawes DM, Ho JD, Kroll MW, Miner JR. Electrical Characteristics of an Electronic Control Device Under a Physiologic Load: A Brief Report. *Pacing Clin Electrophysiol*. Mar 2010;33(3):330-6.

12. The X26 CEW has an arcing voltage of 50,000 V. As explained earlier this is irrelevant as to safety. The arcing voltage is to increase the probability of the CEW having an effect on the subject without the necessity of probe penetration of the skin. Voltage is the force behind the charge. Approximately 1,000 V is required to allow an electrical arc through air of 1 millimeter (mm). There are 25.4 mm in one inch. The fixed electrodes on the front of the X26 CEW are 40 mm (1.6") apart, or an attached expended cartridge, are ≈ 45 mm apart. Thus, if the cumulative probe or electrode separation or electrical resistance to the subject is greater than the voltage necessary to arc across 40 mm of air, then, the arc will occur at the fixed electrodes and not deliver a charge to the subject.

13. TASER CEWs meet all international electrical safety standards, including the American National Standards Institute (ANSI) CPLSO-17-2017, Electrical Characteristics of ECDs and CEWs; as well as Professor John Webster's proposed safety standard.[72] As officers are taught, according to the literature, "the nominal electrical outputs of TASER X26(E), X26P and X2 CEWs lie within safety bounds specified by relevant requirements … [electrical safety] standards"[73] See Outline:

14. As the literature finds, and as TASER training includes, CEW exposures and those with probe spreads of less than 12" are not expected to lead to full incapacitation of the upper extremities regardless of probe spread; and front exposures not leading to full incapacitation of the upper extremities regardless of probe spread [74]

15. As the literature finds, as TASER training includes, and as experience demonstrates, a recipient of even a broad-probe spread CEW exposure is expected to recover immediately (about 1 second) from the CEW delivered charge effects upon conclusion of the delivered charge.[75]

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[72] Nimunkar AJ, Webster JG. Safety of pulsed electric devices. *Physiol Meas*. 2009;30(1):101-114.

[73] Panescu, M. Nerheim and M. Kroll, "Electrical Safety of Conducted Electrical Weapons Relative to Requirements of Relevant Electrical Standards," Conf. Proc. IEEE Eng. Med. Biol. Soc., vol. 2013, pp. 5342–5347[73]

[74] Ho J, Dawes D, Miner, J, Kunz S, Nelson R, Sweeney J. Conducted electrical weapon incapacitation during a goal-directed task as a function of probe spread. *Forensic Sci Med Pathol.* Apr 2012.

[75] Criscione, J.C., Kroll, M.W. 2014. Incapacitation recovery times from a conductive electrical weapon exposure. *Forensic Sci Med Pathol.* DOI 10.1007/s12024-014-9551-x. Published online 26 March 2014;

16. As TASER training demonstrates, a completed circuit is necessary to deliver an electrical charge to a subject. For a CEW to deliver an electrical charge to a person it is necessary that the CEW have a completed circuit capable of delivering, and then maintaining, the charge to the subject.

17. As demonstrated in TASER CEW training, there are 3 basic modes of CEW use with delivered discharge: (1) drive stun, (2) probe mode, and (3) three-four-point mode. Each has differing parameters and expected effects as explained earlier.

18. As reported in TASER CEW training and materials, TASER CEWs have been tested and reported in the literature on intoxicated persons. The leading paper concludes: "Conclusions: Prolonged continuous CEW exposure in the setting of acute alcohol intoxication has no clinically significant effect on subjects in terms of markers of metabolic acidosis. The acidosis seen is consistent with what occurs with ethanol intoxication or moderate exertion."[76]

19. As stated in TASER CEW materials, even under optimal probe spread circumstances (greater than twelve inches in high muscle-mass areas of the body) the CEW maximally produces 46% of muscle contractions.[77,78]

20. As TASER training materials include, the TASER X26 CEW specifications allow for clock drift of up to ± 4 minutes per month. TASER Armorer Certification Course, TASER X26 and Advanced TASER M26, Version 2, March 2006, Manual, page 164. "[X26 CEW Clock] Drift can be 1-4 minute +/- per month range"

X26 internal clock (2003)

- *Clock is run by the central microprocessor which runs other functions of the unit. Similar to new desktop PC.*
  - *Timing circuit is part of the microprocessor*
  - *Keeps a better time drift tolerance*
  - *Power is supplied by the DPM/XDPM(2 X 3 volt lithium cells) via the capacitor.*
  - *The capacitor disperses power to the unit.*
  - *Drift can be 1-4 minute +/- per month range*

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and John Criscione, Ph.D., M.D., An Independent Assessment of the Physiological and Cognitive Effects from the X-26 TASER® Device in Volunteer Human Subjects, Final Report. Also, see TASER Training Program videos showing immediate recovery.

[76] Moscati R, Ho JD, Dawes DM, JR Miner. Physiologic effects of prolonged conducted electrical weapon discharge in ethanol-intoxicated adults. *Am J Emerg Med.* Jun 2010;28(5):582–7.

[77] Sweeney J. Transcutaneous Muscle Stimulation. In: Kroll M, Ho J, eds. TASER Conducted Electrical Weapons: Physiology, Pathology, and Law. New York City: Springer-Kluwer; 2009.

[78] Sweeney JD. Theoretical comparisons of nerve and muscle activation by neuromuscular incapacitation devices. Conf Proc IEEE Eng Med Biol Soc. 2009;31:3188-3190.

Case Specific Opinions:

18. As the literature states, the CEW has significant less physiologic and metabolic effects than other force options, including continued struggling. See Outline sections:

19. As the literature states, CEWs do not increase physiologic effects beyond that which continued exertion would increase. See Outline section:

20. According to the several pieces of literature and book sources the optimal force option in attempting to capture, control, facilitate restraint, and deliver a subject to medical care is the use of a CEW in probe-deployment mode. The basic reason for this is the CEW's, in probe mode, ability to overcome volitional muscle control. For a list of these references and some quotes from the published literature please see my Outline at section:

Just as one example, of those listed in my Outline, pages 199:

2. (03/2017 Nakajima) Nakajima, Y., Vilke, G.M., Chapter 12: Use of Force in the Prehospital Environment, Zeller, S.L., Nordstrom, K.D. and Wilson, M.P. (eds.) (2017) *The Diagnosis and Management of Agitation*. Available at: https://www.cambridge.org/core/books/the-diagnosis-and-management-of-agitation / F579A66F96776E2DC8B807613B8E6A23.

    a. **Key Point:** TASERs are used commonly in the prehospital setting to ensure safety of personnel and the altered, aggressive, and agitated patient.

    b. **Key Point:** TASERs are increasingly used to control violent and aggressive individuals while maintaining a margin of safety, as well as to reduce the need

for impact weapons and injuries associated with their use. They are reported to have prevented many law enforcement personnel injuries as well as subject injuries.

c. "Quickly controlling an ExDS subject in the prehospital setting to minimize the subject's exertional activity is a priority, while maintaining both the safety of providers and the subject. ExDS subjects typically have altered mental status, are often paranoid, and are essentially impossible to effectively communicate with, making verbal de-escalation of little value. The use of an ECD such as TASER to rapidly gain physical control and restrain a subject is preferable to the approach of going hands-on, as heavy physical exertion may exacerbate acidosis in the subject and contribute to a greater risk of sudden death. Data have shown that exertion and struggle increase acidosis more than use of a TASER (Ho et al. 2010). The goal is rapid control allowing as little struggle as possible by the subject. Once the subject is restrained and scene safety is secured, the medical evaluation and treatment can begin for the patient." (page 179, highlighting emphasis added).

FRCP 26(a)(2)(B)(iii) any exhibits used to summarize or support them:

The exhibits or list of references used as a summary of or support for the information and opinions in this report specifically include, but are not limited to, each illustration, graphic, chart, drawing, diagram, table, PowerPoint® slide, and video in this report, referenced in this report, or included in any of the references to this report, as well as any documents, or portions thereof, referenced or cited, or any compilation of documents, are to be considered exhibits to this report and may be utilized as exhibits at deposition and/or trial, or for any other purposes. These exhibits specifically include, but are not limited to: any document, information, illustration, Microsoft® PowerPoint, lesson plan, drawing, chart, table, diagram, picture, graphic, video, compilation, etc., that is on, or included in, any of the TASER International, Inc. (TASER) training CDs/DVDs (versions 1 through the current release – which is presently version 20), TASER annual user updates and update PowerPoints, the Outline, TASER CEW Research Index and library, TASER CEW Research Index, TASER Fact Sheets (TFSs), as well as the TASER Research Compendium, the Arrest-Related Death Research Index and Compendium, TASER CEW Field Data and Risk Benefit PowerPoint presentations and Analyses, The TASER website (including updates and additions), the www.ecdlaw.info and www.ipicd.com websites, etc. Exhibits also include a TASER Strikelight, TASER Pulse, TASER Bolt, TASER C2, TASER X2 Defender, TASER X26™ CEW (X26 CEW), fully kitted X26 CEW, TASER CEW cartridges, TASER CEW cartridge wire, TASER CEW probes, X26 CEW Digital Power Magazine (DPM), a Van de Graff generator, two (2) three-volt Duracell® CR123 cells, stacks of 10,000, 25,000, 50,000, and 100,000 sheets of copy-type paper, vehicle battery jumper cables, 110 V alternating current (AC) electrical cords/cables, ground fault circuit interrupter (GFCI), a twelve ounce can of Pepsi® or other soft drink, an empty twelve ounce can, a Nikon® F6 camera, electric fence energizers of various brands, electroconvulsive therapy (ECT) generator, transcutaneous electronic nerve stimulators (TENS) of various brands, RF generator, watch with metal or metallic band, other exhibits, and exhibits also include other demonstrative aids, charts, graphics, illustrations, diagrams, tables, videos, and demonstrations.

Attached Resume

My curriculum vitae containing a detailed list of my relevant formal education, training, experience, publications authored, and a listing of any cases in which testimony (deposition and/or trial) as an expert has been taken is provided and made an integral part hereof.

FRCP 26(a)(2)(B)(vi) Compensation for Study/Testimony in the Case:

The expert compensation that is expected to be paid in this case is as follows:

1. **Initial Retainer** - which includes case review, research, communications with counsel, etc. is a flat-fee non-refundable retainer of $0.00 plus expenses. This initial retainer does not include report generation, on-site research, testimony, expenses, or the like.

2. **Report** - the additional flat fee for a written report is $0.00. Any additional report, including supplemental report, will each be invoiced a separate and additional flat fee of $0.00.

3. **Testimony, On-Site Visit/Research, Extraordinary Services** - are invoiced at a flat daily fee of $2,500.00 per day plus expenses. Research, document retrieval, accumulation, etc. will also be invoiced as additional fees. If the deposition is noticed as a video recorded deposition, or is recorded, there is an additional flat fee of $1,000.

To date no invoice has been provided and no retainer has been received. No compensation is contingent upon the outcome of this case or the opinions expressed.

Attachments/Appendices