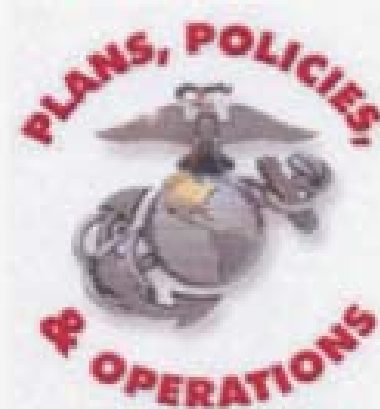


The views expressed in this study constitute the personal views of the author, and do not represent those of PLI, PL, PP&O, HQMC, USMC, DoN, or DoD



Compact High Power Laser Dazzler (CHPLD)

**Ground Combat Element (GCE) Advocate
Science and Technology (S&T) Advisor Case Study**

Franz J. Gayl

Franz J. Gayl 7 Feb 08

Information Operations and Space Integration Branch (PLI)
Strategy and Plans Division (PL)
Plans, Policies, and Operations Department (PP&O)
Headquarters United States Marine Corps (HQMC)

7 February 2008

**Compact High Power Laser Dazzler (CHPLD)
Case Study**

Table of Contents

I. Executive Summary

II. Body

1. Introduction

- a. Purpose
- b. Methodology
- b. Constraints

2. Background

3. Discussion 1 - CHPLD Chronology of Events

- a. CHPLD-related events and documents 2001 through summer 2005
 - (1) The first USMC DEW NLW expressions of need
 - (2) The COMMARFOREUR expression of dazzler need
 - (3) The Full Spectrum Effects Platform (F-SEP), a.k.a. “Project Sheriff”
 - (4) Expressions of Congressional concern with USMC push-back on Sheriff
- b. II MEF Fwd Dazzler UUNS of 9 Jun 05
 - (1) II MEF (Fwd) Dazzler UUNS submission
 - (2) 3rd Bn, 6th Mar LRNLW UUNS submission
 - (3) II MEF (Fwd) UUNS follow-up communications
 - (4) MCCDC’s elimination of urgency in fulfillment of II MEF (Fwd)’s UUNS
 - (5) Renewed Congressional interest in USMC dazzler-related needs
 - (6) MCCDC Force Protection Integration Branch NLW priorities
 - (7) Air Force Research Lab best of breed side by side evaluation
 - (8) MCCDC FPI preselects GBD-IIIC in spite of test data and II MEF UUNS
 - (9) Department of the Navy (DoN) JAG law of armed conflict approval
 - (10) Laser Safety review Board Approval (LSRB) approval of the GBD IIIC
 - (11) I MEF (Fwd) continued urgent need for the CHPLD
 - (12) NSWCDD Laser Safety Program (G73) testing of the CHPLD
 - (13) NSWCDD and JNLWD dissemination of the CHPLD evaluation
 - (14) Renewed I MEF (Fwd) efforts to solve the Dazzler need with CHPLDs
 - (15) Northrop Grumman Corporation (NGC) “Project 208”
 - (16) I MEF (Fwd) discovery that DC, CDI’s guidance had been ignored
- c. I MEF (Fwd) CHPLD-related UUNSS of Dec 06
 - (1) Small Unmanned Combat Air Vehicle (SUCAV)

(2) Mobile Acoustic Sniper Detection and Neutralization System (MASDANS)

d. I MEF (Fwd) Compact High Power Laser Dissuasion (CHPLD) UUNS of 1 Dec 06

- (1) I MEF (Fwd) CHPLD UUNS submission
- (2) MARCENT intervention on behalf of I MEF (Fwd)
- (3) 2nd NSWCCD Laser Safety Program (G73) test of the CHPLD
- (4) Presentation of the CHPLD to the LSRB on 16 Feb 07
- (5) Independent testing of the CHPLD by Laser Compliance

4. Discussion 2 - Dazzler safety, effectiveness, and production considerations

- a. Dazzler safety and effectiveness considerations
- b. Dazzler production considerations

5. Discussion 3 – CHPLD Case Study-relevant activities

- a. Recent Dazzler press and political activities
 - (1) Magazine and newspaper articles relating to dazzlers and CHPLD
 - (2) 28 Jun 07 Senator Biden and Senator Bond letter sent to SECDEF
 - (3) 30 Jul 07 CMC response to Sen. Biden (and Sen. Bond)
- b. JNLWD and MCCDC patterns regarding the handling of NLW requests
 - (1) Long/Mid-Range Acoustic Devices (LRAD/MRAD) parallel at MCCDC
 - (2) “StunStrike” Anti-IED proprietary information sharing by JNLWD

6. CHPLD Case Study Conclusions

- a. CHPLD Chronology Conclusions
- b. CHPLD Analysis Conclusions

7. CHPLD Case Study Recommendations

- a. Immediate USMC change recommendations
- b. Concurrent DoD change recommendations
- c. Proposed supporting legislation

III References

- a.1. Article – Tampa Bay Tribune (Lardner), 31 Jan 07
- a.2. Article – Defense Technology International (CHPLD) (Axe), Mar 07
- a.3. Article – AP - Marines Fail to Get Gear to Troops, 25 May 07
- a.4. Article – Seattle Times (Mundy), 24 Jun 07
- a.5. Article – Seattle Times (Mundy), 1 Jul 07
- a.6. Article – Defense Technology International (SUCAV) (Axe), Jul 07
- a.7. Article – MCCLL GBD-IIIC Injury Reports, 3 Aug 07
- a.8. Article – Associated Press - CMC Admits Flaws, 3 Aug 07
- a.9. Article – Inside the Pentagon (Castelli), 23 Aug 07
- a.10. Article – AP - Pentagon Rejects Ray Gun Weapon in Iraq, 30 Aug 07
- a.11. Article – Inside the Pentagon - UUNS Audit, 18 Oct 07
- a.12. Article – World Politics Review (Axe), 20 Nov 07
- a.13. Article - Government Security News - CHPLD, 26 Nov 07
- a.14. Article – Wired - Noah Shachtman - How Technology Almost Lost the War, 27 Nov 07
- a.15. Article – AP - General: Anbar Ready for Handover, 10 Jan 08

- b.1. Book – Barnett, Thomas P.M. (05). Blueprint for Action. New York: Berkley Publishing.
- b.2. Book – Barnett, Thomas P. M. (04). The Pentagon’s New Map. New York: Putnam.
- b.3. Book – Bugliarello, George (03). The Biosoma. New York: Polytechnic University.
- b.4. Book – Christensen, Clayton M. (02). Innovators Dilemma. Boston: Harv Bus School.
- b.5. Book – Christensen, Clayton M. (04). Seeing What’s Next. Boston: Harvard Bus School.
- b.6. Book – Christensen, Clayton M. (03). The Innovators Solution. Boston: Harv Bus School.
- b.7. Book – Col Qiao & Col Wang (99). Unrestricted Warfare. Panama: Pan Am Publishing.
- b.8. Book – Friedman, Thomas L. (05). The World is Flat. New York: Farrar-Strauss-Giroux.
- b.9. Book – Kao, John (07). Innovation Nation. New York: Free Press.
- b.10. Book – Krulak, Victor H. (99). First to Fight. Bluejacket Books.
- b.11. Book – Kruzweil, Raymond (05). The Singularity is Near. London: Penguin Books.
- b.12. Book – McKenzie, Kenneth F. (00). Revenge of the Melians. Washington, DC: NDU.
- b.13. Book – Patreus and Nagl (06). FMFM 3-24 Counterinsurgency. Wash., DC: U.S. Army.
- b.14. Book – Small Wars Manual (40) - NAVMC 2890. Washington, DC: Gov Print Office.
- b.15. Book – West, Francis J. “Bing” (72). The Village. New York: Pocket Books.



- c.1. Congress – Thornberry to OFT – F-SEP, 13 Jan 05
- c.2. Congress - Snowe to CNR - LRAD, 20 Jan 04
- c.3. Congress - USD(ATL) to Thornberry - F-SEP, 27 Jan 05
- c.4. Congress – Snowe to SECDEF - LRAD, 18 Mar 05
- c.5. Congress – Snowe to SECNAV – F-SEP, 12 Apr 05
- c.6. Congress – ASN(RDA) to Snowe - F-SEP, 7 Jun 05
- c.7. Congress – Larson to ASA(ALT) - F-SEP, 9 Aug 05
- c.8. Congress – Sherwood to CMC - Dazzler, 26 Aug 05
- c.9. Congress – Congress - Dodd to Army OLA - CHPLD, 30 Aug 05
- c.10. Congress – Dodd-Larson to DoD - CHPLD, 10 Jan 07
- c.11. Congress – USMC OLA to Larson, 20 Feb 07
- c.12. Congress – Sen. Biden and Sen. Bond to SECDEF, 28 Jun 07
- c.13. Congress – CMC to Sen. Biden and Sen. Bond, 30 Jul 07

- c.14. Contract – [Customer Name Omitted] 9 CHPLDs, 11 Oct 06
- c.15. Contract – USMC 28 CHPLDs, 11 Oct 06
- c.16. Contract – Navy SEALs 1 CHPLD, 26 Mar 07
- c.17. Contract – ATC 2 CHPLDs, 17 May 07
- c.18. Contract – Navy-SAIC 1 CHPLDs, 27 Jul 07
- c.19. Contract – ATC 3 CHPLDs, 17 Oct 07
- c.20. Contract – DOS 26 CHPLDs, 28 Nov 07
- c.21. Contract – Army 14 CHPLDs, 24 Jan 08
- c.22. Contract – ATC 2 CHPLDs, 27 Aug 07
- c.23. Contract – DEW 3 CHPLDs, 17 Oct 07

- e.1. E-Mail – CG, 3rd MAW to DC, CDI, Apr 03
- e.2. E-Mails – All Available Dazzler-Relevant E-Mail, 05 – 07
- e.3. E-Mail – MCCDC message announcing Sound Commander decision, 24 Aug 06
- e.4. E-Mail – DC, CDI to CG, I MEF (Fwd), 13 Sep 06
- e.5. E-Mail – Exchange between I MEF (Fwd) and MCCDC on LRAD, early Sep 06
- e.6. E-Mail – Ti Casazza to GCE Advocate S&T Advisor, 31 Jan 08

- l.1. Letter – CG, 1st Mar Div to DC, CDI requesting Sheriff, 29 Aug 04
- l.2. Letter – CG, II MEF to DC, CDI requesting Sheriff, 7 Oct 04
- l.3. Letter – Director OFT to DC, CDI, 25 Jan 05
- l.4. Letter – Eye Exams of LE Systems Employees 2005-2007, 19 Aug 05
- l.5. Letter – LE Systems to CG, I MEF (Fwd), 24 Dec 06
- l.6. Letter – LE Systems to CMC, 9 Apr 07
- l.7. Letter – DC, CDI to LE Systems, 20 Apr 07
- l.8. Letter – CMC to Sen. Biden and Sen. Bond, 30 Jul 07
- l.9. Letter – Sen. Biden and Sen. Bond to CMC, 19 Sep 07
- l.10. Letter – CMC to Sen. Bond, 21 Sep 07

- l.11. Legal – DoN JAG Approval of GBD-IIIC & CHPLD, 22 Dec 05
- l.12. Legal – Army JAG Approval of GBD-III, 14 Feb 06

- o.1. Order – MCO 3500.27B Operational Risk Management (ORM)
- o.2. Order – MCO 5100.8 Occupational Safety and Health (OSH) Policy
- o.3. Order – MCO 5100.29A Safety Program
- o.4. Order – MCO 7510.5A FWA Oversight, Awareness, Prevention and Remedies
- o.5. Order – MCO 5800.13A Investigations of Allegations Against Senior Officials
- o.6. Order – MCWP 5-1 Marine Corps Planning Process (MCPP)
- o.7. Order – OPNAVINST 5100.27A/MCO 5104.1B, 24 Sep 02

- p.1. Presentation – ONR Red Team Report, 18 Sep 04
- p.2. Presentation – JNLWD-NGC Project 208, 6 Dec 05
- p.3. Presentation – I MEF (Fwd) rationale for LRAD 500 solution, 28 Aug 06
- p.4. Presentation – Draft DDR&E presentation cancelled by USMC, 13 Mar 07

- p.5. Paper – MCWL Situation Report, 7 Jan 05
- p.6. Paper – The ONR Green Perspective, 1 Nov 05
- p.7. Paper – Penn State ARL AHD LMUA Final Report, 7 Aug 06
- p.8. Paper – Naval Audit Service report on the USMC UUNS Process, 28 Sep 07
- p.9. Paper – Five Examples of USMC Gross Mismanagement, Aug 07
- p.10. Paper – NGC-AFRL-JNLWD HORNET, Dec 06
- p.11. Paper – GCE Advocate MRAP Case Study, 22 Jan 08

- r.1. Requirement – NLW UUNS, 18 Dec 01
- r.2. Requirement – Laser Sniper UNS, 18 Dec 01
- r.3. Requirement – GACAWS UNS, 13 May 02
- r.4. Requirement – COMARFOREUR Letter, 18 Feb 03
- r.5. Requirement – CG, 1st Mar Div Sheriff Letter, 29 Aug 04
- r.6. Requirement – CG, II MEF Sheriff Letter, 7 Oct 04
- r.7. Requirement – II MEF FSEBW UUNS, 14 Oct 04
- r.8. Requirement – PP&O CDTS FSEBW Input, Oct 04
- r.9. Requirement – S&T Addendum to the GCE ARL, 4 Dec 04
- r.10. Requirement – MNC-I F-SEWS Time Critical JUONS, 7 Apr 05
- r.11. Requirement – USMC 2005 EMW Capabilities List (ECL), 15 Apr 05
- r.12. Requirement – II MEF (Fwd) Dazzler UUNS, 9 Jun 05
- r.13. Requirement – 3/6 LRNLW UUNS, 28 Jul 05
- r.14. Requirement – I MEF (Fwd) LRAD UUNS, 26 Jun 06
- r.15. Requirement – MNF-W SUCAV JUONS, 30 Sep 06
- r.16. Requirement – MNF-W MASDANS JUONS, 18 Oct 06
- r.17. Requirement – MNF-W LRNLW JUONS, 12 Nov 06
- r.18. Requirement – I MEF (Fwd) SUCAV UUNS, 1 Dec 06
- r.19. Requirement – I MEF (Fwd) LRNLW UUNS, 1 Dec 06
- r.20. Requirement – PASDEW UUNS, 3 Dec 06
- r.21. Requirement – CG, I MEF (Fwd) Needs Continuity Letter, 27 Dec 06
- r.22. Requirement – I MEF (Fwd) CHPLD UUNS, 1 Dec 06
- r.23. Requirement – MNF-W MASDANS UUNS, 13 Dec 06

- t.1. Test – AFRL Best of Breed Spreadsheet, 16 Sep 05
- t.2. Test – AFRL Multi-Product Test Report, 16 Sep 05
- t.3. Test – Legal - Approval of CHP Battery, 29 Dec 05
- t.4. Test – LSRB GBD-IIIC NLW CONOPS Approval Letter, Feb 06
- t.5. Test – 1st Aug 06 NSW CDD G73 Evaluation of CHPLD, 7 Aug 06
- t.6. Test – 2nd Feb 07 NSW CDD G73 Evaluation of CHPLD, 1 May 07
- t.7. Test – LSRB CHPLD NLW Disapproval Letter, 22 Feb 07
- t.8. Test – Laser Compliance Test Report, 27 Sep 07
- t.9. Test - USA Preventative Medicine Test of GBD-III, 28 Dec 05

Compact High Power Laser Dazzler (CHPLD) Case Study

I Executive Summary

1. Introduction

a. Purpose. The study uses a recent example of a Ground Combat Element (GCE)-requested capability that encountered combat development challenges in order to illuminate some of the potential deficiencies inherent to Marine Corps combat development processes. The perspectives shared here are those of the author who serves as the Science and Technology (S&T) advisor to the Deputy Commandant, Plans, Policies, Operations (DC, PP&O) and GCE Advocate. The author of this case study also served as the Science Advisor to the Commanding General (CG) I Marine Expeditionary Force – Forward (I MEF [Fwd]) during some of the events described herein.

b. Methodology. This case study is composed of two detailed discussions. The first constitutes a chronology of events documenting USMC-specific involvement with CHPLD. The second discusses safety, effectiveness, and production issues as they relate to the CHPLD. Finally, the case study addresses interactions between the USMC and Congress and independent investigations by journalists and the resulting articles. The case study conclusions and recommendations flow from those three areas of discussion and analysis.

c. Constraints. In accordance with DC, PP&O guidance, this study did not include interviews or written queries of any employees or institutions coming under the command or oversight of the larger Marine Corps combat development community. These are understood to include MCCDC, the EFDC, Marine Corps Systems Command (MCSC), the Marine Corps Warfighting Laboratory (MCWL), the Joint Non-Lethal Weapons Directorate (JNLWD), and the USMC S&T Program at the Office of Naval Research (ONR).

2. Background. The CHPLD Case Study was conducted in an effort to better understand the challenges USMC operating forces encountered when seeking combat developer support for a capability of interest to the GCE Advocate. The CHPLD Case Study discussions, conclusions, and recommendations are drawn from the references and author's recollections, both in his capacity as the S&T Advisor to the GCE Advocate, as well as the Science Advisor to CG, I MEF (Fwd), 2006 through early 2007. The details contained within the case study represent a combination of verifiable documents, written communications, and the recollections of others who are knowledgeable of the CHPLD topic.

3. Discussion

a. Bottom Line Up Front (BLUF). Since as early as 2001 HQMC Advocates have been formally requesting the development of non-kinetic non-lethal weapon (NLW) capabilities (References r.1., r.2., r.3., r.8., and r.9.). USMC operating forces have been doing the same. These requests included need submissions originating from Marine Corps Forces Europe (MARFOREUR) (Reference r.4.), 1st Marine Division (MarDiv) (Reference r.5.), and the II

Marine Expeditionary Force (MEF) (References r.6. and r.7.). These requests were not fulfilled by USMC combat developers at the Marine Corps Combat Development Center (MCCDC) or the Marine Corps Systems Command (MCSC). Then in June 2005 II MEF (Fwd) submitted an Urgent Universal Need Statement (UUNS) for a Compact High Power Laser Dazzler (CHPLD), a Commercial-Off-The-Shelf (COTS) dazzler NLW product from LE Systems, Inc. (Reference r.12. and r.13.). The request was also not fulfilled, with hundreds of innocent Iraqi becoming casualties during Escalation of Force (EOF) incidents. In 2006 I MEF (Fwd) repeatedly submitted renewed CHPLD-dependent UUNS requests, including a revalidation of the II MEF (Fwd) request (References r.18., r.22., and r.23.). In light of Quantico's non-fulfillment of the CHPLD requests I MEF (Fwd) open purchased 28 CHPLDs directly from the vendor in an effort to reduce the unnecessary casualties from EOF incidents. Upon learning of this Quantico influenced CG, I MEF to prohibit their employment on alleged safety grounds. These repeated combat developer denials cost additional hundreds of innocent Iraqi casualties during EOF incidents during I MEF (Fwd)'s tour. In January 2007, 18 months after the submission of II MEF (Fwd)'s original UUNS for the COTS CHPLD, USMC combat developers delivered a more hazardous and less effective material solution in the form of a modified laser pointer/designator known as the Green Beam Designator – III Custom or GBD-IIIIC, a COTS product from BE Meyers. NLW subject matter experts (SMEs) and middle managers at MCCDC, MCSC, and the Joint Non-Lethal Weapons Directorate (JNLWD) made recommendations to prohibit the CHPLD and promote the GBD-IIIIC (e.2.). Test and Evaluation personnel at the Naval Surface Warfare Center Dahlgren Division, Code G73 (NSWCDD G73) and the Naval Laser Safety Review Board (LSRB) supported the USMC combat developers in dazzler decision making (References e.2., t.1., t.2., t.3., t.4., t.5., t.6., and t.7.). It is the observation of the author that each of those organizations has demonstrated both technical and operational shortcomings in dazzler analysis and decision making. It is also the observation of the author that each of those organizations have excersized competition-stifling practices that led to the dismissal of the GCE-requested CHPLD and the fielding of a more hazardous and less capable system. Independent testing of the CHPLD has now determined that much of the technical and operational data used to dismiss the CHPLD from consideration as a material solution was erroneous (Reference t.8.). These deliberate combat developer acts created a significant adverse impact on the MEF (Fwd) GCE's ability to accomplish its mission, with measurable operational consequences.

b. CHPLD Chronology of Events

In 2005 Marines of the MEF (Fwd) increasingly found themselves compelled to employ kinetic force to stop suspect vehicles at check points and entry control points. These Escalation of Force (EOF) incidents sometimes resulted in the death and injury of innocent Iraqi civilians who had merely failed to heed visual warnings. There was even one case of a U.S. civilian contractor killed by Marines in a similar case of mistaken intent. If preventable harm to civilians during EOF continued it would have an adverse impact on II MEF Forward's (Fwd's) ability to accomplish the Marine Corps' Information Operations (IO) and Public Affairs (PA) missions in Al Anbar Province. On 9 Jun 05 II MEF (Fwd) submitted an UUNS requesting 400 COTS Laser DazzlersTM from LE Systems, Inc. II MEF (Fwd) Subject Matter Expert (SME) research had determined that the CHPLD was the highest power COTS laser dissuasion device on the U.S.

market. It also projected the largest spot size on target, and could be employed safely closer to the target (Reference r.12. and r.13.).

MCCDC was responsible for receiving, analyzing, and defining a requirement to fulfill the Jun 05 Dazzler UUNS. The JNLWD provided MCCDC SME support. In the summer of 05 the JNLWP sponsored a “best of breed” side-by-side test of several green laser devices, including the CHPLD, at the Air Force Research Lab (AFRL). One of the other candidates was the BE Meyers GBD IIIC. The AFRL test determined that the CHPLD was safer with a closer-in Nominal Ocular Hazard Distance (NOHD), and more effective by producing glare at a longer range in the daytime. However, MCCDC and later JNLWD and MCSC, endorsed the GBD IIIC in contradiction of both the operator request and the AFRL report (References e.2., t.1., and t.2.).

The contrary combat developer commitment to the GBD-IIIC survived the protests of operators in theater and even a later second UUNS from I MEF (Fwd) that again requested the CHPLD. The combat developer decision to sole-source the GBD-IIIC also extended the GCE delivery delay to over 18 months. I MEF (Fwd) concern with delays in delivering any dazzler capability to the GCE prompted CG, I MEF (Fwd)’s authorization to his staff to open purchase 28 CHPLDs using Operations and Maintenance (O&M) funds. The CHPLDs were delivered to Iraq before the arrival of the first fielded GBD III. In response, MCCDC, JNLWD, and MCSC raised CHPLD safety concerns causing the GCE to be prohibited from employing the systems it had purchased. Without any non-kinetic NLW capability EOF incidents continued to harm innocent Iraqis while jeopardizing the safety and mission of the Marines (References e.2., r.18., r.22., and r.23.).

The urgency of the operational need for Dazzlers was not debatable, since the tragedies it was designed to mitigate had already been experienced. These included hundreds of innocent Iraqi deaths and injuries by the time I MEF (Fwd) submitted a second UUNS in Dec 06. Similarly, the specified CHPLD sole source material solution within both Dazzler UUNSs was not debatable. The operational advantages of the CHPLD’s four wide-divergence, high power, parallel laser sources is unique. Finally, enhancements to the critical MEF Information Operations (IO) and Public Affairs (PA) missions were not trivial. Combat developers were cognizant of the superiority of the COTS CHPLD since the AFRL test report of 2005. Instead, 18 months later a less safe and less effective GBD-IIIC was fielded to the GCE. This common foreknowledge shows blatancy in combat developer actions and inactions regarding the GCE CHPLD needs. Today, USMC combat developers have been the recent subjects of press investigations by the Associated Press, the Seattle Times, Inside the Pentagon, Defense Technology International, the Danger Room blog, and the World Politics Review (e.2, r.18, r.22., r.23., a.1., a.2., a.3., a.4., a.5., a.6., a.7., a.9., a.12. and a.13.).

Laser Compliance, a company that performs independent testing of laser related products for industry to insure safety and spec compliance, recently tested the GCE-requested CHPLD. This testing determined that the CHPLD is significantly safer to employ in operations than the GBD-IIIC. The independent testing invalidates evidently flawed Naval evaluation and LSRB dismissal of the GCE-requested CHPLD. The Marines in Iraq continue to employ the less safe of the two lasers, with reports of eye injuries from the GBD IIIC, even if only temporary, and consequent restrictions on its Concept of Employment (COE). In the meantime,

Army, Department of State and other government customers have procured and/or employed CHPLD's in quantity and to reported operational user satisfaction (References t.8., c.14., c.15., c.16., c.17., c.18., c.19., c.20., c.21., c.22., c.23., c.24., and a.13.).

The USMC has funded procurement and improvements to several million dollars worth of GBD-IIICs. The safer and more effective CHPLD has been prohibited by the USMC, in spite of its widening use within other military Services and Executive Departments. USMC combat developers site user satisfaction with the GBD-IIIC. This is understandable since any visible laser is better than none at all. However, given that there was and is a safer and more effective capability available, the combat developer actions, inactions and delays may be worthy of a formal investigation.

4. Conclusions. The CHPLD presents a case in which Marine Corps combat development organizations did not provide timely and effective material solutions to commanders in the field. In the process of non-fulfillment, several Marine Corps Orders may be relevant, specifically References o.1., o.2., o.3., o.4., and o.5. USMC combat developer actions, inactions, and resulting delays led to operational consequences that are worthy of the attention of the Inspector General of the Marine Corps (IGMC). Other conclusions are listed at the end of the study body.

5. Recommendations. The CHPLD case study should be provided to the IGMC for further investigation. Other recommendations are listed at the end of the study body.

Compact High Power Laser Dazzler (CHPLD) Case Study

II Body

1. Introduction

a. Purpose. The study uses a recent example of a Ground Combat Element (GCE)-requested capability that encountered combat development challenges in order to illuminate some of the potential deficiencies inherent to Marine Corps combat development processes. The perspectives shared here are those of the author who serves as the Science and Technology (S&T) advisor to the Deputy Commandant, Plans, Policies, Operations (DC, PP&O) and GCE Advocate. The author of this case study also served as the Science Advisor to the Commanding General (CG) I Marine Expeditionary Force – Forward (I MEF [Fwd]) during some of the events described herein.

b. Methodology. This case study is composed of two detailed discussions. The first constitutes a chronology of events documenting USMC-specific involvement with CHPLD. The second discusses safety, effectiveness, and production issues as they relate to the CHPLD. Finally, the case study addresses interactions between the USMC and Congress and independent investigations by journalists and the resulting articles. The case study conclusions and recommendations flow from those three areas of discussion and analysis.

c. Constraints. In accordance with DC, PP&O guidance, this study did not include interviews or written queries of any employees or institutions coming under the command or oversight of the larger Marine Corps combat development community. These are understood to include MCCDC, the EFDC, Marine Corps Systems Command (MCSC), the Marine Corps Warfighting Laboratory (MCWL), the Joint Non-Lethal Weapons Directorate (JNLWD), and the USMC S&T Program at the Office of Naval Research (ONR).

2. Background. The CHPLD Case Study was conducted in an effort to better understand the challenges USMC operating forces encountered when seeking combat developer support for a capability of interest to the GCE Advocate. The CHPLD Case Study discussions, conclusions, and recommendations are drawn from the references and author's recollections, both in his capacity as the S&T Advisor to the GCE Advocate, as well as the Science Advisor to CG, I MEF (Fwd), 2006 through early 2007. The details contained within the case study represent a combination of verifiable documents, written communications, and the recollections of others who are knowledgeable of the CHPLD topic.

a. CHPLD-related events and documents 2001 through summer 2005

In December 2001, the Deputy Commandant for Plans Policies and Operations (DC, PP&O), LtGen Buck Bedard began to make his first formal Ground Combat Element (GCE) Advocate inroads into the combat development process with directed energy weapons (DEW). Since arriving in PP&O in 2000, he had been an ardent supporter of the development of

advanced Non-Lethal Weapons (NLW) capabilities through his oversight of the Joint Non-Lethal Weapons Program (JNLWP). He was particularly interested in the potential of adapting DEW technologies for the purpose of near term NLW applications. He was the earliest senior DoD advocate for the Active Denial Technology (ADT) millimeter wave NLW technology initiative of the Air Force Research Lab (AFRL). Similarly, he was the earliest senior DoD advocate for the Advance Tactical Laser (ATL) of the Boeing Corporation. His leadership on both of those initiatives led directly to their approval as Advanced Concept Technology Demonstrations (ACTDs).

With regards to visible dazzlers, General Bedard's realization of the operational potential of lasers as near-term NLW capabilities occurred in Somalia in the early 1990s. There he observed first hand the dramatic operational utility of visible laser dazzlers as NLWs having fully reversible effects.

(1) The first USMC DEW NLW expressions of need

As the GCE Advocate, General Bedard began to impact the nearer term transition of DEW NLW by means of Universal Need Statements (UNS) submissions. The UNS was the authoritative heir to the Fleet Operational Need Statement (FONS) as the mechanism for formally standing up requirements, and programming new-start resources. Synthesizing his direct operator knowledge of the immediate need for both DEWs and NLWs, General Bedard generated three key early UNSs, with two being focused on accelerating NLW DEW S&T and procurement for operations in Afghanistan:

(a) On 18 Dec 01 DC, PP&O signed the NLW Capability Urgent UNS (UUNS) (Ref. r.1.), which sought a solution for the chronic need for a non-kinetic NLW that could presumably only be fulfilled with a DEW capability. The urgency of the request related to on-going operations in Afghanistan for which non-kinetic NLW could make a critical contribution, NLWs like ADS and dazzlers. This particular UUNS resulted in no USMC-specific science and technology (S&T) investments and it remains unfulfilled today.

(b) On 18 Dec 01 DC, PP&O also signed a second UNS titled the Improved Sniper Capability UUNS (Ref. r.2.). This document was had a more focused intent of developing a laser capability to succeed kinetic sniper rifles in some cases, once high energy laser (HEL) technologies were matured and miniaturized for tactical military operations. This UUNS also did not result in any USMC-specific S&T investments, and remains unfulfilled today.

(c) On 13 May 02 DC, AVN (LtGen Nyland) and DC, PP&O (LtGen Bedard) jointly signed the Gunship Advanced Combined Arms Weapon Suite (GACAWS) UNS (Ref. r.3.). The GACAWS UNS sought to capitalize on maturing DEW technologies for tactical gunships, independent of the platform that would eventually be selected to host such weapons. Laser weapons capabilities were central to GACAWS. This particular UNS greatly assisted in the approval of the Advanced Tactical Laser (ATL) ACTD. An excerpt from the GACAWS UNS states: ***“From an airborne vantage point, the supported ground force needs to have a non-lethal capability to proactively control crowd perceptions by disorienting, confusing, distracting, deceiving, obscuring, or dazzling individuals and groups, to cause anxiety that***

disrupts crowd cohesion, making disjunctive participants more receptive to the message and will of Marine forces.” The UNSs noted above served an important function in garnering and maintaining Joint support for DEW technology development. However, no direct resource support from MCCDC, MCSC, or the USMC S&T Program materialized, so the Marine Corps could not buy a stake in the combat development of, and thereby steer those technologies for future gunship applications.

(2) The COMMARFOREUR expression of dazzler need

Generals Bedard and Nyland were not the only senior USMC leaders with a specific interest in operationalizing DEW, such as visible laser dazzlers, in the near-term. Understanding that hand-held and weapons-mountable dazzlers were Commercial-Off-The-Shelf (COTS) capabilities, LtGen Martin Berndt, in his capacity as the Commander of Marine Forces Europe (COMMARFOREUR) wrote a letter (Ref. r.4.) to CMC. His letter had two purposes. The first was to endorse a draft “Operational Requirements Document (ORD)” defining a specific set of ADT systems transition configurations. The draft ORD had been created by PP&O for proposal to MCCDC in anticipation of the approval and resourcing of the ADT-oriented NLW UNS. LtGen Berndt’s specific interest extended to dazzler NLWs as well. In his letter to CMC he included the request that: *“The MROC consider the urgent resourcing of 20 hand-held and/or rifle-mounted laser dazzlers...to MARFOREUR for on-going operations.”* As with the UNSs that the GCE Advocate had submitted previously, COMMARFOREUR’s letter resulted in no known dazzler procurement at MCSC, or dazzler requirement development at MCCDC.

(3) The Full Spectrum Effects Platform (F-SEP), a.k.a. “Project Sheriff”

USMC GCE Advocate interest in the earlier fielding of DEW, as well as the participation of both USMC and Army as signatories to the ADS and ATL ACTDs, gained the attention of VADM Arthur Cebrowski (Ret.) who served as the DoD, Director of Force Transformation. Under his office fell the Office of Force Transformation (OFT), and a budget dedicated to developmental seed funding. Given Service willingness to match OFT funding and provide a Program Manager, Director OFT was prepared to contribute resources. These cooperative OFT endeavors were designed to accelerate the fielding of advanced capabilities for operational experimentation, spiral development, and earliest transition. DEW, along with national security space, were areas where VADM Cebrowski saw a need to place what he referred to a “big bets.” He directed Col Pat Garrett, USMC and later his successor Col Wade “Cookie” Hall, USMC to engage the HQMC GCE Advocate on the potential for a partnership to operationalize tactical non-lethal DEWs sooner through an initiative the Admiral nicknamed “Project Sheriff.”

Under Col Hall, Project Sheriff took on the name “Full-Spectrum Effects Platform (F-SEP),” and the specific DEW and other weapons technologies began to take on specificity. In close coordination with the office of the USMC GCE Advocate, an OFT down-selection determined the F-SEP mix of conventional and advanced technologies, both COTS and those maturing in the lab.

In addition to conventional lethal capabilities aboard an armored platform, the 1st spiral of the “full spectrum” would integrate in COTS laser dazzlers, a Long Range Acoustic Device (LRAD), a high power white light (HPWL) and a Counter Improvised Explosive Device (C-IED) jammer, at a minimum. Based on the relative immaturity of compact vacuum tube-based ADT, solid state ADT, and Active Protection (AP), the ADT and AP components of Sheriff would be considered for inclusion in the F-SEP suite in subsequent spirals. The maturity would be gauged in-stride with a funded, accelerated program whose combined arms foundation was robust, not allowing the failure or exclusion of any component technology to undermine the capability.

The GCE Advocate under LtGen Bedard had been interested in participating in Sheriff. However, USMC participation required cooperation of the combat developers at Quantico. For Sheriff this included the Office of Naval Research, (ONR) the Marine Corps Warfighting Lab (MCWL), Marine Corps Systems Command (MCSC), and MCCDC. The developers in this case also included the Joint Non-Lethal Weapons Directorate (JNLWD), given the inclusion of COTS dazzlers, LRAD, and ADT.

When LtGen Bedard retired, DEW advocacy shifted away from PP&O to DC, CDI during the period of 2003 to 2004. BGen Richard Zilmer, who then served as the Director of the Strategy and Plans Division continued to appreciate the value of NL DEWs for the future of the GCE and even in OIF. BGen Zilmer continued to encourage earlier operationalization of dazzlers, millimeter wave (MMW) ADT, high power microwave (HPM) C-IED, HEL, and electrostatic discharge (ESD) weapons. In the course of continuing advocacy efforts BGen Zilmer permitted his staff to reach out to like-minded operational commanders for the purpose of garnering support for F-SEP participation at Quantico.

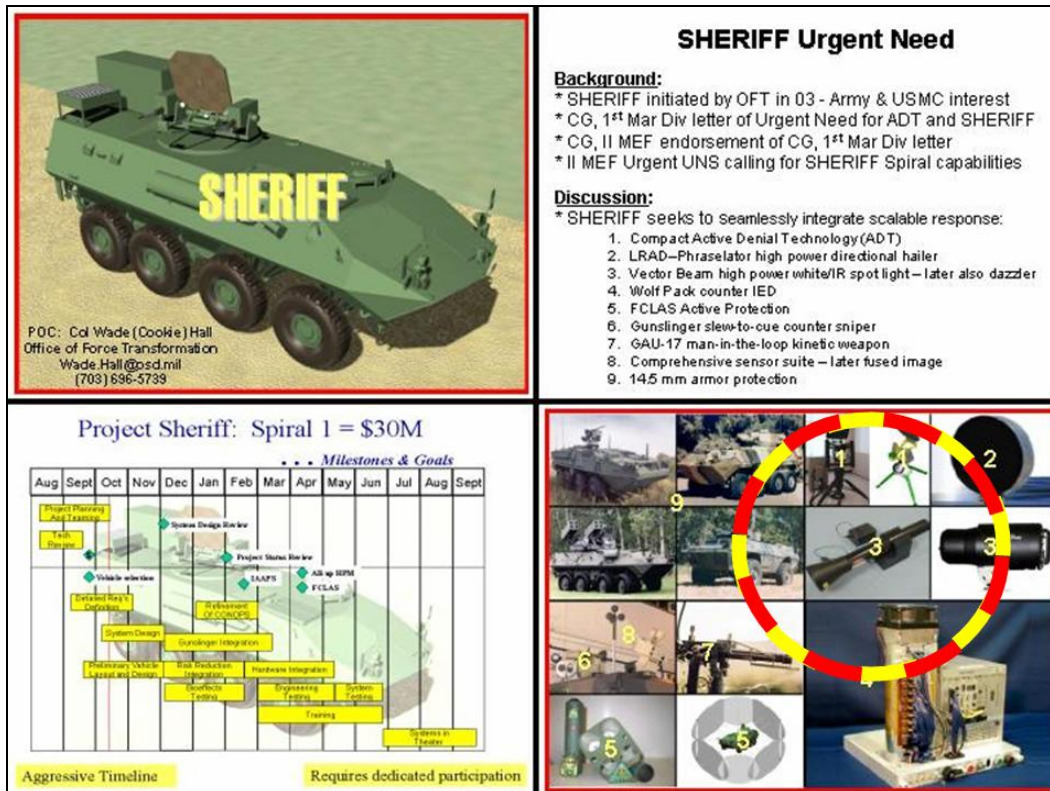


Figure 1. OFT 2004 Sheriff quad chart with dazzler component circled in Block 3.

The effort to reach out to operators that BGen Zilmer had encouraged was successful. On 29 Aug 04 the CG of the 1st Marine Division Sheriff Letter submitted a letter (Ref. r.5.) to DC, CDI endorsing the OFT-sponsored Sheriff initiative and recommending USMC involvement. In his letter MajGen Natonski wrote in part: ***“Considering the applicability of Sheriff to OIF-2, recommend USMC assume sponsorship and lead for the program to insure USMC receives its intended Quick reaction capability products [which incorporated the dazzler] as soon as possible.”***

On 7 Oct 04 the CG of the II MEF submitted a letter (Ref. r.6.) to DC, CDI endorsing CG, 1st Mar Div’s letter and further reinforcing the need for USMC involvement in the Sheriff program. In his letter, LtGen Amos (as II MEF Commander) wrote, in part: ***“I enthusiastically endorse CG, 1st Marine Division’s recent urgent need request for the subject advanced capabilities [which incorporated the dazzler]. I also strongly concur with CG, 1st Mar Division’ suggestion that USMC consider assuming sponsorship and lead for the Office of force transformation-initiated SHERIFF Program to insure that USMC can field an initial, spirally developed, combined arms capability quickly. Consequently, this letter constitutes a II MEF urgent need for the capability defined in [MajGen Natonski’s letter].”***

The GCE Advocate, under Strategy and Plans, and the staffs of the two signatories (Generals Natonski and Amos) closely monitored the MCCDC response to the two letters. It quickly became clear that no action would be taken by MCCDC in response to the expressed operator interest. Recognizing the continued challenges of obtaining an OFT and USMC partnership for the rapid development and fielding of the urgently needed non-kinetic

NLW capabilities, on 14 Oct 04 CG, II MEF (LtGen Amos) signed an Urgent UNS (UUNS) (Ref. r.7.) for a **“Full-Spectrum Effects Battle Weapon (F-SEBW).”**

Upon the arrival of the FSEBW UUNS at MCCDC at the Expeditionary Force Development Center (EFDC) it was entered into the Combat Development Tracking System (CDTS). It is within the CDTS that the Functional Advocates at Quantico and HQMC could enter their comments on the submitted UUNS for consideration during MCCDC analysis. PP&O, as the GCE Advocate, concurred with the UUNS. PP&O’s CDTS comments (Ref. r.8.) stated in part: **“PP&O concurs with the II MEF FSEBW (SHERIFF) Urgent UNS as written. SHERIFF will benefit Marines in OIF by integrating direct fire lethal kinetic energy weapons (KEW) and directed energy weapons (DEW) as compact, combined arms ‘systems of systems’ aboard armored vehicles, for employment by individual operators and crews...Dazzlers...LE Systems of Boston, MA produces COTS dazzlers (in the eye-sensitive green regime) of a somewhat higher output power...Green is desired as threshold for each SHERIFF platform due to eye-sensitivity to green, with strapped/bundled blue, green, and red in concert as objective.”** Figure 2 shows the dazzler aperture integration envisioned by PP&O in CDTS:

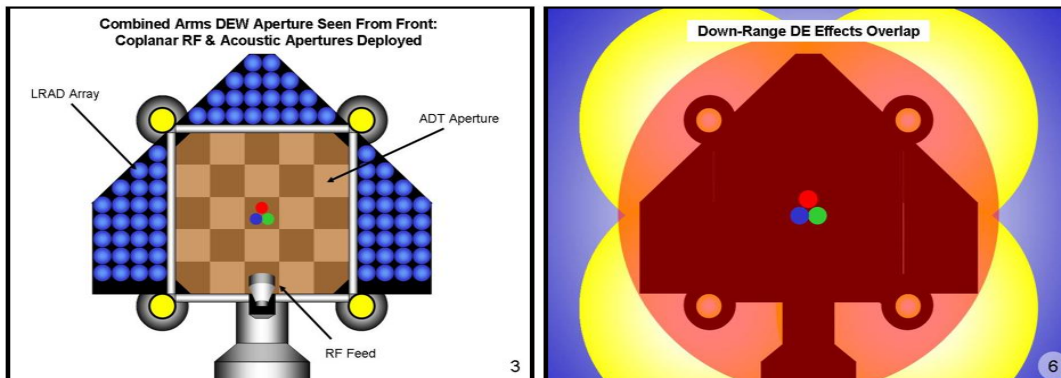


Figure 2. Combined Effects NL DEW Aperture with objective Dazzler capability.

Since the FSEBW UUNS called for some advanced technologies such as Active Denial Technology (ADT) and Active Protection, in addition to COTS high power white light, LRAD, and dazzlers, the UUNS was turned over to an ONR “Red Team” for an evaluation of the maturity of the various components. Following a detailed assessment of the Technology Readiness Levels (TRLs) of all of its component parts the Red Team thought the FSEBW was a realistic rapid fielding endeavor. In its 18 Sep 04 presentation (Ref. p.1.) to the CG, MCWL (BGen Waldhauser) and the Director of the USMC S&T Program at ONR (Mr. George Solhan), the Red Team recommended that FSEWS/Sheriff be developed and fielded by USMC. The only dissenting opinions came from the MCCDC NLW requirements team participants, but they were outvoted. The final recommendation slide from the Red Team presentation is pictured below:



Recommendations



- **Pursue COA 3**
 - **Allows Activity in FY05**
 - Sets up for ACTD (Technical and System Progress and Allows Other Services to Accept Sheriff and Get Ready)
 - OP Experimentation
 - Maintain Momentum as Developed from Gunslinger, Overwatch and ADS ACTD
 - **Spiral Development**
 - **Opportunity to Merge Gunslinger, Overwatch, Sheriff, FIR/RE and REDCAR**
 - **USMC Leverage Gunslinger Contributions**
 - **ACTD FY06 – 07 Start (Sooner Better)**
 - Provides an Established Process (Gunslinger)
 - OIPT = Stake Holders (US Army, USMC, OSD (OFT & ASC))
 - ONR – TM (LCPP FNC)
 - PACOM – OM (USARPAC/MFP)
 - USA – XM (USA Futures Center and a PEO)

Red Team Report Out 2.ppt 22

Figure 3. COA 3 recommendation slide from Red Team presentation.

Amplifying the Red Team recommendation to proceed, in its CDTS comments the GCE Advocate (PP&O) concurred with capabilities mix of II MEF FSEWS UUNS (with the dazzler component called out in detail), as well as the intent of proceeding to develop the FSEWS capability: When PP&O stated *“PP&O concurs with the II MEF FSEBW (SHERIFF) Urgent UUNS as written,”* the GCE Advocate comments focused on specific technology statements called out in the UUNS, such as: *“Spiral 3 DEW capabilities need to include solid state technology-based ADT NLW, an improved HPWL/IRL generation system, and a multi-color coherent dazzler, all having threshold effectiveness beyond the maximum range from which an RPG can be effectively aimed.”* The USMC funding contribution to FSEBW/Sheriff Phase 1 would be refurbished LAV-AD vehicles or new Cougars and a few million dollars in integration resources. OFT would provide the remainder for weapon and equipment development and procurement, if USMC agreed to lead the program.

The Red Team recommendation to proceed with the program was not concurred with by the CG, MCWL or the Director of the USMC S&T Program at ONR. Following expressions of concern by the MCCDC and MCSC NLW Programs, the Red Team proposal was vetoed by MCWL and ONR. In an e-mail “SITREP” on 7 Jan 05 CG, MCWL BGen Waldhauser reported (Ref. p.5.) the Sheriff way-ahead to USMC leadership:

Sheriff. DC CD has reviewed the "Sheriff" proposal from OSD Office of Force Transformation for investment in FY05.

- Sheriff is a proposed integration on a single vehicle of Directed Energy (high-power microwave), anti-sniper (sensors and rapid slew/engagement system), active anti-RPG protection, and IED defeat systems.
- Marine Corps has been asked to provide an LAV and some resources to support initial spiral development.
- ONR-led review of technology readiness (with Joint Non-Lethal Directorate involvement) identified critical deficiencies in candidate technologies, proposed schedules, and CONOPS. Deficiencies represent unacceptable risk to warrant the investment as a potential capability for OIF II/OEF.
- However, close monitoring of Sheriff technology development is a means of refining requirements for MEFV/FCS and potential readiness for candidate technologies, to be deployed separately to OIF/OEF when utility is demonstrated.
- DC CD and MARCORSSYSCOM exploring feasibility of providing a single refurbished LAV-AD to serve as platform for concept-demonstrator. Vehicle will represent the Marine Corps contribution to FY05 Sheriff spiral development; level of involvement in spiral 2 will be determined after assessment of technology readiness following spiral 1.

Figure 4. Extract from the CG, MCWL 7 Jan 05 SITREP of MCWL activities.

Upon hearing of the MCWL, ONR, and MCCDC NLW decision to push back, OFT sought to preserve USMC interest. In one of his last official visits, on 10 Jan 07 VADM Arthur Cebrowski visited DC, CDI (LtGen Mattis) privately in his Quantico office. He sought to convince DC, CDI of the potential warfighting benefits for OIF from the earliest introduction and operational experimentation with DE NLWs like dazzler, ADT, LRAD, and other non-kinetic NLW capabilities. The meeting was apparently effective in swaying the perspective of LtGen Mattis back towards USMC full participation.

On 25 Jan 05 VADM Cebrowski captured in a letter (Ref. 1.3.) the understanding the two had reached in their private meeting at Quantico two weeks earlier. ***"Thank you for the brisk and substantive discussion on 10 January and the support offered to Strategic Transformation and Project Sheriff. Your agreement to provide a refurbished Light Armored Vehicle – Air defense platform and the necessary funding to integrate and initial USMC Sheriff capability is a crucial step forward in the Marine Corps transformational development. I understand that this refurbishment and initial Sheriff Integration will constitute a commitment of \$3.5 million. When combined with my \$5 million contribution, we can press ahead in exploring this transformational capability."***

Yet in spite of DC, CDI's agreement to participate as recorded in OFT's letter, neither MCWL nor MCCDC followed through on participation. OFT was planning on raising the issue again, however VADM Cebrowski's terminal illness forced his retirement from OFT duties. It is noteworthy the minimum contribution of the LAV-AD demonstrator platform, nor the close USMC tracking of Army Sheriff progress assured by CG, MCWL's in his e-mail SITREP occurred.

(4) Expressions of Congressional concern with USMC push-back on Sheriff

Learning of the USMC push-back on Sheriff, members of Congress also began to share their concerns. On 13 Jan 05 Rep. Mac Thornberry wrote (Ref. c.1.) SECDEF encouraging Marine and Army participation in Project Sheriff, and DoD funding of the program. In his letter he stated in part: *“As you finalize the Administration’s 2006 Fiscal Year Defense Budget, I would like to highlight for your consideration a few key programs related to Transformation.... Project Sheriff brings together non-lethal and lethal technologies currently under development across the Department to improve Army and Marine unit force protection for vehicles operating in urban environments. The system is designed to operate as a ‘counter-personnel’ weapons system. Project Sheriff could be deployed this year, but such a time table would require an additional \$20 million and focused attention to bring the services together.”*

Then on 12 Apr 05 Sen. Olympia Snowe wrote (Ref. c.5.) to then SECNAV, Mr. Gordon England. Her letter stated in part: *“...the U.S. must be discriminate in all actions without compromising the ability of our...Marines to respond lethally and instantaneously as required...Several Joint warfighters have expressed an urgent need for an armored vehicle with an integrated suite of non-lethal and lethal components so that troops can respond to the tactical situation with a scalable response. I am aware of the [OFT] initiative called [F-SEP], also known as Project Sheriff...It is my understanding that the [ONR] ...conducted a Red Team assessment of the Sheriff enabling technologies...and [the Red Team] recommended proceeding with immediate developmental action. Unfortunately, it appears that neither the Red Team recommendation for ONR to proceed with F-SEP development nor the urgent operational needs of Joint Forces have been acted on decisively. I am writing to seek your assistance in encouraging the Naval S&T and requirements organizations to accelerate Project Sheriff technologies in full cooperation with OFT and JNLWP...”*

Responding for SECNAV, the Assistant SECNAV for Research, Development and Acquisition (ASN[RDA]) responded to Sen. Snowe saying in part (Ref. c.6.): *“Although the Red Team report was favorable to the concept, the Marine Corps determined that the proposed Spiral 1 Sheriff was not a suitable material solution to the immediate operational needs of the Marine Corps supporting Operation Iraqi Freedom.”*

On 7 Apr 05 a Time Critical JUON (Ref. r.10.) asking for the F-SEP emerged from CENTCOM. The Joint Rapid Acquisition Cell (JRAC) approved the need, and DEPSECDEF reprogrammed \$31.5M to develop the first spiral of Sheriff. This funding also contained enough resources for the 6 LAV or Cougar integrated systems for the USMC in fulfillment of the II MEF need, if the USMC volunteered to take an active programmatic role. Unfortunately, the USMC S&T and MCCDC NLW Programs’ decision to defer to Army interest caused the developmental funding to be provided entirely to Army. As a result, the “F-SEWS” platform became a Stryker of little applicability to USMC’s urgent need as the refurbished LAV-AD was not provided.

b. The II MEF Fwd Dazzler UUNS of 9 Jun 05

(1) II MEF (Fwd) UUNS submission

Separately, from within theater, on 9 Jun 05 II MEF (Fwd) submitted an UUNS (Ref. r.12.) requesting 200 COTS Compact High Power Laser Dazzler (CHPLD) and 200 Standard Dazzler NLWs from LE Systems, Inc. of Hartford, CT. The UUNS was titled "Laser Dazzlers," and it stated in part: ***"Marine Forces manning Check Points, ECPs, Convoys and Perimeter security positions need a non-lethal, non-damaging method of gaining the attention of Iraqis in order to warn them that they are entering a Lethal Force Authorized Zone. The Laser Dazzlers provide up to 400 meters stand off ability, to safely focus an eye safe laser at the approaching person to warn them."*** The II MEF (Fwd) requirement was developed based on the technical insight and product searches of the Subject Matter Experts (SMEs) in theater, most significantly LtCol Jimmie P. Harmon, the II MEF (Fwd) G3 Force Protection (FP) Special Projects Officer and Col G.I. Wilson, the II MEF (Fwd) FP Officer.

In signing the UUNS the CG was indicating the need for speed in fielding an initial capability for operational experimentation. He was willing to accept risks, as MEF Fwd CGs are prepared to do with any rapidly fielded, urgently needed capability to solve problems quickly. Here, those risks related to accepting a sole source COTS capability that had been determined by his SMEs to be optimal, even though it had not been subjected to the rigors of formal acquisition processes. As a result, the CG identified the product, the vendor, and even included specific pricing information to permit Quantico contracting officials to execute rapidly. To make clear that the CG, II MEF (Fwd) was requesting a thoroughly researched COTS product-enabled capability, vendor details were included in the UUNS. It stated in part: ***"Requirement: - Laser Dazzlers; LE Systems Inc. (LESI); 91 Prestige Park Circle, Suite 5, East Hartford, CT 06108; (860) 291-9630 (W), (860) 291-9475 (F); http://laserdazzler.net/; (200) CHP Laser Dazzlers: \$6,750.00 EA; (200) Standard Laser Dazzlers: \$3,312.00EA; Total requested (400) Laser Dazzlers - Total Estimated Price = 52,012,400.0"***

The I MEF (Fwd) staff followed up immediately to put pressure on MCCDC, MCSC, MCWL, and others to execute the quickly. On 27 Jul 05, LtCol Jimmie P. Harmon wrote an e-mail to Col G.I. Wilson and the Assistant Chief of Staff (A/CS) G3, Col Starnes T. Glenn. LtCol Harmon was the author-researcher of the II MEF (Fwd) Dazzler UUNS. E-mail (Ref. e.2.) excerpts included: ***"Some more background data on the [LE Systems CHPLD] Dazzlers. This may really help reduce our EOF numbers...This is exactly the type of effect we were looking for. The Dazzlers will be used to slow down vehicles and warn them away prior to EOF reaching lethal levels. The attachment of the Dazzlers to a weapon makes that escalation of force VERY natural and easy should it be warranted."*** The II MEF (Fwd) A/CS G3 responded (Ref. e.2.) with the sense of urgency that drove the COTS product-specific need from its inception with: ***"We are sold on the Dazzler - who isn't and why? Is [this] my level or DCG? Push!"***

Later that day, LtCol Harmon received word that Quantico was discussing the insertion of the approval of the Naval Laser Safety Review Board (LSRB) as a prerequisite to any dazzler purchases for the MEF. In an e-mail (Ref. e.2.) to the II MEF (Fwd) MARCORSYSCOM Liaison Officer (LNO), Col Edward D. Daniel, LtCol Harmon asked: ***"Why are we putting the Dazzlers before a LSRB? The only alternatives we have are lethal force...What value does the LSRB add to this process? Starting to get real pressure to move this directly to the GO level for intervention..."*** Recognizing that Quantico was beginning to

wrest control of the direction and pace of dazzler fielding away from II MEF, Col Daniel intervened.

In an e-mail (Ref. e.2.) that included a addressing of a representative of the MCCDC EFDC, LtCol Katchlein, Col Daniel wrote: ***“The subject of getting the laser dazzlers approved, regardless of the safety concerns, came up again this afternoon...Given that we're killing civilians in EOF incidents, the desire to put anything into the fight that might work better seems reasonable...What will it take to gain approval of the laser dazzlers so we can field them?”*** The significance of this particular e-mail is that the EFDC, which included Mr. Grundy, is the senior USMC NLW Requirements official. From within MNF-W's AOR Col Daniel, representing CG, II MEF (Fwd)'s sense of urgency specifically informed MCCDC that II MEF (Fwd) wanted to assume the risks of fielding the COTS LE Systems Dazzler immediately, for the sake of speed.

(2) 3rd Bn, 6th Mar LRNLW UUNS submission

Separately, on 28 Jul 05 the Commanding Officer of 3/6, LtCol Julian D. Alford signed an UUNS (Ref. r.13.) requesting a Long Range, Non-Kinetic, Non-Lethal Weapon (LRNLW). 3/6 was due to deploy to the I MEF (Fwd) AOR within the coming week. Personnel from the battalion were well aware of the success that other II MEF (Fwd) and Joint units were experiencing with non-kinetic optical and acoustic systems, including the LRAD and Dazzlers. The purpose of the UUNS was to ensure that when the CHPLDs and any future LRADs were procured by USMC and shipped to theater that the Battalion would both help with defining the integrated combined arms design and also guarantee delivery of some systems to 3/6.

The description of the 3/6 need stated in part: ***“3/6 has an urgent operational need for a man-portable Long-Range, Non-Kinetic, Non-Lethal Weapon (LRNLW). As a threshold capability, the LRNLW needs to possess...the physical ability to adapt a wide-aperture 500 - 1000 mW class green laser dazzler. As an objective the combination needs to include the integrated wide-aperture 500 - 1000 mW class green laser dazzler.”*** The 3/6 UUNS continued: ***“Recommendation. Provide 6 COTS integrated LRNLWs possessing L/MRAD, Phraselator, HPWL, and Green Laser Dazzler, and provide funding for the time critical material release, fielding and sustainment.”*** As with the II MEF (Fwd) UUNS that preceded it, the 3/6 UUNS was not acted upon by MCCDC.

(3) II MEF (Fwd) UUNS follow-up communications

Back in Iraq, the slow response of SYSCOM, MCCDC, and MCWL to the urgency of II MEF's need for the devices continued. Mr. John Murray, the II MEF (Fwd) MCWL LNO, provided supporting encouragement to Quantico to speed the process of getting the II MEF (Fwd) UUNS-requested CHPLDs on contract. In a 2 Aug 05 e-mail (Ref. e.2.) to Col Daniel he stated: ***“Have pinged MCWL about delay in laser dazzlers. They came back with the question of who was getting them? Do you know if the lab was buying or if SYSCOM was buying?”*** The full context of MCWL's return questions is not known, but it was becoming clear that MCWL, SYSCOM, and MCCDC were not successful in deconflicting roles and responsibilities on the II MEF (Fwd) UUNS.

On 3 Aug 07, Col Daniel's fellow SYSCOM LNO in the II MEF G9, LtCol Luis Villanueva, wrote a pivotal e-mail regarding II MEF (Fwd)'s yet unfulfilled urgent need for the LE Systems Dazzlers. His e-mail was directed at representatives of the Naval Laser Safety Program. These included Mr. Sheldon Zimmerman, the Program Manager whose team would eventually execute two evaluations of the CHPLD. It also addressed Mr. Zimmerman's alternate POC and the Program's Laser Safety Engineer, Mr. Robert Aldrich and Mary Gorschboth, another member of the Zimmerman's NSWCDD Program team. LtCol Villanueva also addressed his e-mail to LT Jamaal A. Whitmore and LCDR Vincent T. Hill, both of the Naval Bureau of Medicine and Surgery (BUMED). Together, these laser safety specialists heavily influenced LSRB decision making under CDR R. S. Lawry, the Chairman of the LSRB.

Of note is the fact that Mr. Carlton Land served as the laser NLW SME at the JNLWD. Mr. Land's exact history of connections to the NSWCDD are not known to the author, however, several members of the JNLWD may in the past have been sourced by, and eventually returned to the NSWCDD jobs following JNLWD tours. In an e-mail communication with the S&T Advisor to the GCE Advocate a year later, Mr. Land confirms that Mr. Zimmerman, LtCol Villanueva's addressee of NSWCDD G73, concurrently served as a member of the LSRB.

LtCol Villanueva's 3 Aug 05 e-mail (Ref. e.2.) stated in part: ***"...We have recently submitted an Urgent Universal Needs Statement requesting these items and they are on our list of top 5 high priorities for MNF-W as identified to the CMC. Based on MNF-W needs I believe LE Systems should be the sole source for this capability..."*** The significance of this particular e-mail is that the NSWCDD, specifically Mr. Sheldon Zimmerman, was being addressed directly by an empowered MARCORSSYSCOM representative from within Iraq. Representing the CG, II MEF (Fwd), he made Mr. Zimmerman aware that the Dazzler UUNS was one of II MEF's top five priorities and that LE Systems products (CHPLD and Standard) were desired as sole source purchases. In 2007 Mr. Aldrich and Mr. Zimmerman would claim that NSWCDD had not received any specific request from USMC to look at the LE Systems CHPLD.

Following up on II MEF's continuing efforts to get Quantico to rapidly engage the LSRB, certify as necessary, procure, and field the CHPLD, Col Jeffrey S. Butter, the MARCENT A/CS G3 wrote an e-mail (Ref. e.2.) to SYSCOM representatives at Quantico, as well as II MEF (Fwd) staff. In it he stated in part: ***"MARCENT...is keenly interested in equipping our Marines with equipment as rapidly as possible because they are facing extraordinary circumstances. Ordinary efforts on their behalf are not satisfactory...Laser Dazzlers are a proven tool that will enable Marines to control traffic flow and prevent unnecessary DEATH - a safety review should be conducted with this in mind...MARCENT expects the safety certification and subsequent fielding of these Dazzlers in terms of days or weeks, not months."*** In this e-mail that was reminiscent of II MEF's communications with MCCDC, Col Butter imparted the sense of urgency of MARCENT, and informed that the assumption of risks of fielding the COTS LE Systems Dazzler immediately was acceptable for the sake of speed.

Having already detected the first signs that II MEF's urgency or choice of sole source material solution was shared by the contracting bureaucracy, Col Daniel made the following e-mail (Ref. e.2.) observation to Col Butter: ***"...I don't think our contracts guys will buy these unless they feel covered by a safety waiver... contracts guys won't pull the trigger...whether here or at HQMC or at MCSC. Similarly, nobody will answer the question 'are these safe'...I'm ready to go to the CG and tell him if he wants them then we simply need to tell the contracts guys to buy them."*** The idea that a safety waiver issued by the correct General Officer authority (such as CG, II MEF) might alleviate contracting officer concerns was raised. On 4 Aug 05 Col Daniel stated (Ref. e.2.): ***"Maybe something will come of the demo for Gen Amos that can shake a cert loose as well."*** The demo mentioned by Col Daniel was a planned demo for soon-to-deploy 2nd Mar Div Marines at Camp Lejeune, NC on 17 Aug 07. LtGen Amos was expected to attend.

In an e-mail (Ref. e.2.) on 4 Aug 05, the AT/FP Officer Col Wilson informed Col Starnes, the II MEF (Fwd) Chief of Staff (CoS) (Col John L. Ledoux), and Col Daniel that: ***"...Col Butter (MARCENT G-3) [is jumping] in and he is now pressing with us to get the dazzlers. There is a demo at Lejeune this month for LtGen Amos. We are fully engaged."*** However, the sense of confidence was short lived when on 6 Aug 05 the MCWL LNO, Mr. Murray received word from that Col Wilson that the LSRB stipulation would impose a severe delay on CHPLD delivery. In an e-mail (Ref. e.2.) he stated: ***"Col GI Wilson... says he is hearing that it will take 6 months to get the laser dazzlers through this board."*** It was beginning at about this time when several forces at Quantico began to wrest the urgency and specified solution of the II MEF (Fwd) UUNS from the control of the MEF, in spite of the CG's willingness to assume all risks.

(4) MCCDC's elimination of urgency in fulfillment of II MEF (Fwd)'s UUNS

Another sign of the loss of MEF and MARCENT influence was the fairly sudden introduction of other less capable and potentially more hazardous material solution alternatives by the JNLWD, MCCDC Requirements Division, and SYSCOM. Six additional COTS pointers and developmental dazzler systems were selected by Quantico combat development action officers to compete against the CHP. The CHPLD-specific sole source request was dismissed entirely in favor of an apparently stacked-deck "best of breed" contest. The additional systems in this contest were the Ghost 1, the U.S. Army REF HELIOS, the Apogen Technologies Dissuader II, and the XADS PDG-105. There were also three laser pointer entrants from one company alone, namely BE Meyers. They included the GBD-III pointer with ½ degree diffuser, the GBD-III, and the GBD-III Custom (GBD-IIIC). The heavy inclusion of BE Meyers products was curious considering that there were other COTS pointer products on the market available for a best of breed down-selection. Instead the best of breed, conducted by the Air Force Research Lab (AFRL), but organized by JNLWD, and MCCDC appeared to favor the outcome with a heavy inclusion of BE Meyers products. It is assumed by many today that NSWCDD, JNLWD, and the MCCDC NLW Requirements Branch influenced the dominance of BE Meyers products in the selection process, however only the IGMC would can establish the veracity of this hearsay.

Compounding the questions regarding the dismissal of the II MEF (Fwd)-requested sole source purchase was the steadfast Quantico (MCCDC, JNLWD, SYSCOM,

MCWL) insistence on the technical authority of the Naval LSRB to evaluate dazzlers as NLWs. This insistence persisted in spite of II MEF's knowledge that the Dazzler UUNS had initiated the first instance where NSWCDD had explored any visible COTS lasers for USMC as non-lethal weapons, beyond mere pointers.

A final aspect of Quantico's effort to regain control of the dazzler development from the MEF and MARCENT relates to an overt anti-CHPLD bias that was shown by NLW action and project officers at MCCDC, SYSCOM, and JNLWD. On 17 Aug 05 ATC and LE Systems came to Camp Lejeune to demonstrate their wares for the Marines of 3/6 and other interested members of the 2nd MarDiv and II MEF staffs. They came at the invitation of 3/6 who had just recently submitted the UUNS for a LRNLW (Ref. r.13.). The LRNLW specifically incorporated the ATC LRAD and the LE Systems CHPLD as two of the integrated capability's enabling COTS components. SYSCOM sent Maj Roper, but although invited, MCCDC and JNLWD were both conspicuously absent. It was reported by the CHPLD vendor that Maj Roper displayed an open disdain towards the LE Systems vendor and his products, in spite of the favorable reception of the CHPLD demonstrations by the Marines attending the demo.

Nor did Maj Roper relay to Quantico the favorable response of operators. However, he did formally report that the CHPLD he was presented had formidable shortcomings in design, reliability, and producibility. These claims later could not be corroborated by any other participants at the demo. E-mail exchanges between Major Roper of SYSCOM, Mr. Land of JNLWD, and Mr. Grundy of MCCDC are alleged by many to contain slanderous comments about LE Systems and the company's products, beginning shortly after the demo. These e-mails remain hearsay as they are not available for viewing and quotation in this case study. However, if the IGMC were to conduct a more comprehensive investigation, the Freedom of Information Act (FOIA) or merely the IGMC's own authority could collect all e-mail communications to, from, and between those three action-level personnel related to the LE Systems CHPLD and the BE Meyers GBD-IIIC.

(5) Renewed Congressional interest in USMC dazzler-related needs

Congressional interest in the II MEF Dazzler UUNS was also high. With spreading Congressional awareness that USMC operators were encountering bureaucratic obstructions to needs fulfillment at Quantico, with the FSEBW a poster child of non-support, other Members began to chime in. Congressional awareness remained keen that dazzlers and other non-kinetic NLW could help reduce the number of innocent casualties in OIF. In a tactfully articulated 26 Aug 05 letter (Ref. c.8.) to then CMC, Gen Hagee Congressman Don Sherwood wrote in part: *"I understand that the Marine Corps is moving aggressively to overcome impediments to the rapid fielding of laser dazzler and acoustic non-lethal weapons (NLW) that are the subject of two Urgent Universal need Statements submitted by operating forces. I request that you support and facilitate rapid fielding efforts, to get these critical advanced dazzler and acoustic NLW capabilities fielded quickly and responsively to protect lives and help our mission in Iraq. I understand that...during recent training of deploying Marines at Camp Lejeune, the safety and utility of the devices were verified first-hand by operators...it is my hope that the focus will be on getting these capabilities in the hands of Marines in a timely fashion, and avoiding the bureaucratic delays...I would ask that you closely follow these*

particular NLW fielding requests to ensure that any remaining obstacles are overcome within the Systems and Combat Development processes.”

Separately, in August 2005 L E Systems provided the JNLWD 2002 and 2005 eye examinations, including retinal photographs, documentation no eye damage. This data was collected on various employees of LE Systems who had been repeatedly exposed to the CHPLD and Standard Dazzlers at close range, including within the 20 meters of the devices at which the Maximum Permissible Exposure (MPE) level of power was routinely exceeded as per the conservative ANZI standard. This doctor-certified medical documentation consistently showed that no LE Systems employees had suffered any signs of retinal damage from these repeated exposures. In 2007 JNLWD, MCCDC, and MCSC were provided the 2007 eye examination results, as well as resubmitted retinal scans, all conducted by a retinal specialist. Like the earlier scans and examinations, the 2007 scans showed no eye damage from toxic light sources. Receipt of the medical evidence provided to MCCDC, MCSC, and JNLWD was never acknowledged, in 2005 or in 2007.

(6) MCCDC Force Protection Integration Branch NLW priorities

Meanwhile, Mr. Grundy, the Deputy Director of the Force Protection Integration Branch of the Combat Development Directorate (CDD) at MCCDC was proceeding with his kinetic non-lethal weapons (NLW) operationalization strategy. Mr. Grundy remains the dominant influence over the content of requirements documents that lead to USMC investments in NLW technologies. He had been an outspoken opponent of any USMC-specific investment in DEW since the inception of the JNLWP. The position of the NLW Program, which he has significant influence over as the requirements spokesperson, is that the JNLWD is responsible for developing DEW NLW. Once the technologies mature the USMC may consider their applicability to the USMC mission sets and NLW kits. Any NLW needs that imply USMC DEW combat development investment in the nearer term have been dismissed since the GCE Advocate began to submit such needs in 2001.

In spite of the USMC NLW Program aversion for DEW, kinetic solutions to operational needs for NLW have been consistently embraced by Mr. Grundy. Kinetic technologies have included shotgun-dispensed, air-charged capacitor “tetherless tasers,” as well as non-lethal vehicle stopping capabilities like X-Net and the Vehicle Lightweight Arresting Device (VLAD). Figure 4 illustrates an example of the robust USMC NLW Program funding commitment to kinetic technologies. Tasers, though determined by MEF operators to be of limited utility in OIF, were robustly funded and widely fielded by the USMC NLW program. Another favored system of MCCDC was Vehicle Non-Lethal Munition (VENOM). In the extract from a 10 Jun 05 CDD EFDC info paper the liberal VENOM funding allocation to is displayed:

- o **Tube Launched Non-Lethal Weapon** - II MEF requests a Tube launched munitions system is provided to the war-fighter for crowd control, area denial to personnel and convoy operations. VENOM (Vehicle Non-Lethal Munition) is a vehicle-mounted device used to launch non-lethal ammunition such as 40 mm stinger balls and smoke grenades, allowing the Marines to put distance between themselves and danger.
 - Status - The VENOM system is currently a developmental system that has been demonstrated to Marine in North Carolina and Hawaii.
 - Cost estimates to complete development
 - \$7,263,163 - PMC for equipment
 - \$3,671,250 - PMC for expendables
 - \$1,832,536 - R&D
 - Recommend request funding via FY06 Supplemental. Delivery 6 months after contract established.

Figure 5. Vehicle Non-Lethal Munition (VENOM) from 10 Jun 05 UUNS info paper.

As further evidence of the USMC NLW program preference for kinetic material solutions a report published at that time is informative. In Sep 05 Mr. Grundy provided a report on a 23-24 Aug 05 meeting of the DoD Joint Non-Lethal Weapons Program Joint Integrated Product Team (JIP). Mr. Grundy is the USMC NLW Program representative. The report was filled with discussions of a broad range of kinetic NLWs with which the Army and USMC operators had experience with or had been exposed to at the subject conference. Mr. Grundy's e-mail (Ref. e.2.) was addressed to JNLWD, MCWL, MCCDC, and the MCWL LNO to II MEF (Fwd). The overwhelming MCCDC-reported focus on kinetic NLWs remained consistent with past priorities, such as: *"...ATFP/NL Capability Sets...foam, water truck (Camp Bucca, Iraq), FN303, CS and OC gases, Claymores, air launchers, tangling systems...MK-19 NLSRM...thermobarics (comparison with MK141)...Sound Commander...TASER...FN303...12 gauge extended range marking round...DefTech 40mm rounds...VLAD, MCCM, Sting Ball Launch Cup, HENLM...MDS for use in a convoy security... a weapon that would combine a NL with a lethal weapon...close range munitions like...beanbags..."* Also consistent with MCCDC precedent was the complete absence of any report of dazzler and like non-kinetic capabilities discussions, even though these had so often been requested of MCCDC in letters, UNSs, and UUNSs over previous years.

In Mr. Grundy's report there was however one exception. In the only mention of the word "dazzler" he did reveal that in a separate meeting: *"...JIP voting principals met with Mr. Kevin Swenson [of the JNLWD and closely affiliated with Carlton Land] to go over the JIP Candidate Submissions...Mr. Swenson...said he will be recommending the Rail-Mounted Green LASER Dazzler be put on hold pending results of ongoing testing..."* This was another sign that Quantico NLW program officials were slowing II MEF (Fwd)'s request to have the COTS CHPLD devices purchased and fielded immediately.

In a 29 Sep 05 e-mail response to Mr. Grundy's report, the MCWL LNO with II MEF (Fwd) acknowledged his feedback from the JIP. In the same e-mail (Ref. e.2.) Mr. Murray asked: *"...Ray - who is tracking the Laser Hazard Analysis on-going to support II MEF UUNS for Laser Dazzler Preliminary Report due out before the end of September."* To this Mr. Grundy responded in e-mail, with additional addressees at MCCDC, MCWL, SYSCOM,

and II MEF: *“We are an active participant in the Laser Dazzler requirement/assessment. And, like all NL capabilities we will be briefing the DWG and making recommendations to DC/CD for the submission of Dazzler to the MROC. Our recommendations will be based on the final comparison report that covers, safety, capability effectiveness, legal review, human effects and unit cost...I have attached the Preliminary Safety Assessment of COTS Laser Dazzlers. You will find that this document provides a wealth of information on ocular and skin laser hazards of capabilities that are currently available...”* This was Mr. Grundy’s indication that MCCDC and JNLWD were now in control of the dazzler way-ahead, not II MEF (Fwd). Neither the urgency of the MEFs and MARCENT, nor the desired CHPLD material solution would influence the FPI Branch or MCSC programmatic path from that day forward.

(7) Air Force Research Lab best of breed side by side evaluation

Separately, the JNLWD was seeking to assess different light technologies and devices for potential operational use, but they were doing so without any sense of urgency. In this effort, AFRL/HEDO responded to a request by JNLWD to provide a laser hazard assessment of the ATC CHPLD and other pointer and developmental lasers that were being considered for potential use as NLWs. The devices were evaluated and compared during September 2005 at AFRL/HEDO. The activities performed included measurements of output power, wavelength, pulse characteristics, beam divergence, and minimum laser beam diameter near the output aperture. Laser safety classification, Maximum Permissible Exposures (MPEs), Nominal Ocular Hazard Distances (NOHDs) for unaided and aided (binocular) viewing, as well as required eye protection Optical Densities (ODs), are calculated in accordance with ANSI Z136.1-2000 American National Standard for Safe Use of Lasers. A limited visual effects assessment was provided as well.

This AFRL “Best of Breed” side-by-side technical comparison of various COTS dazzler candidates is known to have considered the following candidates. The CHPLD of LE Systems, the GBD-IIIC of B.E. Meyers, the GBD-III of B.E Meyers, the GBD-III with ½ inch diffuser, the XADS-PDG-105, the XADS PD/G 200, the Dissuader II of Apogen Technologies, the Ghost 1, and the U.S. Army Rapid equipping Force (REF) HELIOS entrant. The exact sequence of the testing is unclear, i.e. at what point various candidate lasers were introduced and the criteria for the initial down-selection. The initial results of the best of breed were displayed on an Excel spreadsheet (Ref. t.1.):

Parameter	Laser D		PDG-105 XADS
	CHP Dazzler LE Systems, Inc.	GBD-IIIC BE Myers	
Laser Color	Green	Green	Green
Laser Type	Diode-pumped Solid State	Diode-pumped Solid State	Frequency Doubled Laser Diode
Power Output	800 mW (328-725 mW)*	250 mW (204 mW)*	105 mW (98.7 mW)*
Divergence Angle	0.34°	0.09°	0.2°
Size (length x diameter)	11" x 2.5"	10.5" x 1.7"	
Weight (pounds)	N/A	1.5 pounds	
Batteries	Lithium-Sulfur Dioxide	4 AA Alkaline	2 AAA Alkaline
Unit Cost	\$8,803 - Large quantities	\$8,950	\$999
Nominal Skin Hazard Distance (m) (800 sec exposure)	1.74 m	6.9m	1.9 m
Nominal Ocular Hazard Distance (NOHD) (m)	55 m	72 m	19 m
Daytime credible glare distance (m) calculated @ 100 μ W/cm ²	230 m	341 m	87 m
Beam Diameter (spot size) at Daytime Credible Glare Distance	95 cm	50 cm	35 cm
Irradiance (μ W/cm ²) at 100m	537	1177	76
Beam Diameter (spot size) at 100m	41 cm	15 cm	41 cm
Daytime hailing distance estimated to be 2-3 times day glare distance	460 - 690 m	682 - 1023 m	174 - 261 m
Night time credible glare distance estimated to be double daytime glare distance	460 m	682 m	174 m
Night time hailing distance estimated to be 2-3 times night glare distance	920 - 1380 m	1364 - 2046 m	348 - 522 m

Figure 6. Excel spreadsheet segments – only 3 of final AFRL down-selects shown here.

Following the “Best of Breed” side-by-side comparison of the original seven laser systems a down-selection to a final four candidates was conducted, presumably with the inputs of the combat developers at MCCDC. Detailed write-ups and characterizations of the surviving four candidates, of the original seven candidate lasers were included in the AFRL report. These final candidates included the CHPLD, the GBD-IIIC, the XADS PD/G-105, and the XADS PD/G 200.

The author of this case study does not know the precise criteria for further down-selection. However, it is known that in letters to Sen. Biden and Sen. Bond dated 30 Jul 07 CMC stated that: *“In response to this request, Marine Corps Systems Command (MCSC) and the Joint Non-Lethal Weapons Directorate (JNLWD) evaluated the lasers of four manufacturers: BE Meyers, LE Systems, XADS, and Apogen Technologies. The lasers developed by BE Meyers [the GBD-IIIC] and LE Systems were selected for further evaluation.”* The inclusion of the Apogen Technologies laser as a final contender in CMC’s letter is not clear to the author as it was not included in the detailed AFRL report. Nevertheless, as a final outcome of the down-selection process the CHPLD and the GBD-IIIC survived as the top two USMC contenders:



Figures 7. The LE Systems CHPLD. Figure 8. The BE Meyers GBD-IIIIC.

In the AFRL report (Ref. t.2.) the CHPLD had superior NOHD, spot size, price, divergence, and total power over GBD-IIIIC – Daytime glare measured as 186 m for CHPLD and 108 m for GBD IIIIC in final AFRL report. The AFRL report characterized both the CHPLD and the GBD-IIIIC as Class IIIB laser devices. Class IIIB is defined as: “...*moderate power lasers (cw: 5-500 mW, pulsed: 10 J/cm² or the diffuse reflection limit, whichever is lower).* In general *Class IIIB lasers will not be a fire hazard, nor are they generally capable of producing a hazardous diffuse reflection. Specific controls are recommended.*” With regards to the CHPLD the report stated: The: “...*CHPLD contains four lasers that have output parameters that classify the device as a Class 3b laser according to the ANSI Z136.1-2000 American National Standard for Safe Lasers.*” The AFRL Class IIIB rating of CHPLD contrasted with later NSWDD G73 testing that classified the CHPLD as a Class IV. AFRL’s decision to classify the four-source CHPLD device according to the characteristics of only one source is worthy of discussion. The combination-summation of the outputs of the four sources: 1) was not in-phase/coherent, 2) did not constitute a TEM00 beam, and 3) did not propagate along a single coaxial path. The last level of power where these key laser parameters were observed was within each the four self-consistent individual laser sources, each being Class IIIB lasers:



Figure 9. CHPLD - 4 Point Sources. Figure 10. GBD-IIIIC – 1 Point Source.

Beam divergence directly impacts spot size on target, and consequently dazzler effectiveness. A larger spot on target is operationally desirable for a dazzler. During the AFRL testing, laser divergence angles were measured for each of the CHPLD test article's four individual resonators, which were labeled L1, L2, L3 and L4. Measurements were stated in milli radians (mrad), with 17.45 mrad being equal to one degree. The respective measurements were: L1=4.76 mrad, L2=5.0 mrad, L3=5.38 mrad, and L4=4.14 mrad. Combined and average values were not provided in the AFRL report. However, if one takes the approach of average resonator divergence (NSWCDD would employ such a calculation method in its later evaluations in 2006 and 2007), the average divergence of the CHPLD resonators measured at AFRL is calculated to be $19.28/4$, or 4.82 mrad. This calculation also turns out to be conservative, as the actual CHPLD divergence measured during the best of breed comparison at AFRL was 0.34 degrees, or 5.99 mrad. So the operational reality of the CHPLD tested at AFRL was a dazzler device having a divergence of 5.99 mrad. By contrast, the single point source GBD-IIIC exhibited an observed divergence of 0.09 degrees, and was measured in the lab as 1.48 mrad.

As a result the divergence of the CHPLD observed by AFRL was almost four times that of the GBD-IIIC with the direct consequence that the CHPLD would project a larger diameter spot on target at any tactical range. A larger spot was and is critical operationally, repeatedly identified as an operational requirement, and repeatedly and inexplicably ignored. The combination of moving targets, unstabilized operator platforms (weapon mounted or hand-held) and long initial engagement ranges (300 meters required by II MEF and later I MEF as well) made a larger laser spot useful. In order to achieve glare, much less dissuasion of determined adversaries, requires the effective spot to intersect the pupil. The large spot of the CHPLD compensates for the operational realities in this regard. The more rapid dispersion of the CHPLD beam beyond 300 meters was also an advantage, as a pointer like the GBD-IIIC could have unintended consequences far beyond the tactical range-of-concern of the device operator. In other words effects far in excess of 300 meters, like those the GBD-IIIC was likely to produce, were not desired. Again, the larger divergence angle of the CHPLD was advantageous.

As for the most important safety parameter of the two devices, the AFRL results favored the CHPLD. In terms of eye safety and consequent operational utility, the CHPLD had a superior NOHD at 45 meters, as opposed to 67.3 meters for the GBD-IIIC, based on a $\frac{1}{4}$ second blink response. During ECP and CP escalation of force (EOF) encounters in Al Anbar Province, where Marines and Soldiers sought to discriminate intent of approaching vehicles and pedestrians, every addition meter of unrestricted dazzler usage counted, especially in urban terrain. The additional safety buffer of 22.3 meters measured at AFRL that the CHPLD would offer over GBD-IIIC during EOF incidents was significant. Independent testing has since determined that the CHPLD has an even much greater advantage over the GBD-IIIC in this regard. The multi-resonator design of the CHPLD was and remains unique in the ability to balance high power with eye safety closer to the aperture.

Another critical parameter of the two candidate dazzlers was the range from the devices at which credible glare could be achieved on target. With respect to nighttime glare only 30 mW cm² is required. Both devices easily met the 300-meter threshold of the MEFs, in fact both exceeded 400 meters. In fact, the GBD-IIICs potentially unintended effects extended well

beyond 400 meters at night, a drawback for a dazzler. Nighttime glare performance was met by both systems. Daytime glare ranges are more challenging, as eyes are already desensitized to light during the day. For daytime glare 100 mW cm² is required on target. With respect to this parameter the CHPLD was measured at 186 meters. While not meeting the objective 300-400 meter range objectives of the MEFs, the CHPLD well-outperformed the GBD-IIIC which only achieved 108 meters.

Nominal Ocular Hazard Distances (i.e. Safe Employment)

(Shorter Ranges are Better – Zero is Perfect, i.e. Safe Viewing at the Aperture)

Hazard Distance Summary			
Type of Hazard	Exposure Duration (s)	Unaided (m)	Aided (m)
Multiple-Laser NOHD (532 nm)	0.25	45	306
Skin NSHD (532 nm)	600	2.3	2.3

Hazard Distance Summary			
Type of Hazard	Exposure Duration (s)	Unaided (m)	Aided (m)
Intra-Beam Viewing NOHD	0.25	67.3	452
Skin (SED)	600	6.9	6.9

Figure 11. CHPLD and GBD-IIIC NOHD extracts from the Dahlgren report.

Significant Glare Range (i.e. Operational Effectiveness)

- * Significant Glare in Daytime Requires 100 Microwatts per cm²
- * Significant Glare at Nighttime Requires 30 Microwatts per cm²

(My Note - 300 Meters is UUNS Goal in Both the 2005 II MEF and 2006 I MEF UUNSS – Max Glare Range Far Short of 300 Meters Risks Ineffectiveness)

ATC CHPLD			
Irradiance (μW/cm ²)	100	30	10
Range (m)	186	339	583

B.E. Meyers GBD-III			
Irradiance (μW/cm ²)	100	30	10
Range (m)	108	619	1,060

Figure 12. CHPLD and GBD-IIIC NOHD extracts from the AFRL report.

The AFRL report presented a combination of measured and calculated results from its evaluation of the various candidate dazzler systems. The recommendations of the report focused on the regulatory and non-safety/operational aspects of the candidates in addition to summarizing their results, however, the safety and down range effectiveness of the CHPLD were obvious.

(8) The MCCDC preselection of the GBD-IIIC

(a) FPI Branch dismissal of II MEF (Fwd) request for CHPLD

Surprisingly, on 1 Oct 05 Mr. Grundy addressed an e-mail (Ref. e.2.) to MCWL, his MCCDC superiors, and the MCSC LNO embedded in II MEF (Fwd). In it he stated: *“Based upon our initial research and reports conducted AFRL/HEDO on the above mentioned lasers. #1 GBD-III by BE Meyers...Based on the AFRL/HEDO review and the requirements, my hands down recommendation would be the B.E. Meyers GBD-III Custom Laser Dazzler. The GBD-III Custom system provides a Credible Glare (Flash Blindness effect) power density out to 108 meters, Nighttime credible glare power density out to 619 meters, with a eye safety range (Nominal Ocular Hazard Distance - NOHD) of 67.3 meters”* (underline emphasis is the author’s).

The conclusion that Mr. Grundy had arrived at was incomprehensible given that the AFRL/HEDO research and reports to that date would have indicated that the CHPLD was superior from both safety and effectiveness perspectives. Furthermore, no Naval NSWCDD G73 evaluation of the CHPLD had been conducted at this point and neither system had been brought before the LSRB. It was curious for operators and others that a key MCCDC staff member would be endorsing a solution at this point in the process after his insistence on a neutral comparative process. Still, that key MCCDC NLW official on 1 Oct 05 recommended a material solution for the UUNS, one out of sync with the data and specific operator requests.

It is of potential interest here that the GBD-III baseline system may have already been preapproved as a long range laser pointer-designator by several Services, including Air Force, Army, Navy (via NSWCDD), and USMC. The GBD-III was not designed to be employed as a NLW intended for engagement of the unaided eye, in fact Army testing showed that the pointer remained dangerous to unaided at extremely long ranges. From a business case perspective it would have probably seemed most efficient to find a way to adapt the current designator to one that could be employed as a NLW as a secondary purpose. In practice, the initial adaptation of a ½ degree diffuser and later the “Custom” variant were less than optimal attempts to morph the pointer into a NLW. It would have also been efficient from the standpoint of such institutions as NSWCDD, JNLWD, MCCDC, SYSCOM maintaining habitual and comfortable relationships with the BE Meyers vendor, perhaps even increasing business. There is evidence that such a relationship may have existed at Dahlgren during NSWCDD’s assumption of Project Sheriff engineering responsibilities for the OFT (and now Army) initiative. As noted, Mr. Land of JNLWD admitted that the CHPLD had been replaced by the GBD-IIIC in the F-SEP Program.

What stands out in this business case is that BE Meyers may have been permitted to expedite a green pointer through LSRB approval as a NLW, even though it was not designed as such nor had it undergone operational testing as a NLW. The GBD-IIIC had already been tested as a designator and approved for use as such in 2005 by the NSWCDD and LSRB. It had also been approved by AFRL and the Army for similar designator functions. The Navy also apparently already had a contractual relationship with BE Meyers for the GBD-IIIC in support of Project Sheriff and possible other initiatives. For this reason, the LSRB only required a MCCDC Concept of Operations describing a NLW application of that high power, point source visible green pointer for operational approval. To the knowledge of the author no operational testing and no involvement of operational testers was required for this pass-through approval of a highly collimated pointer as a NLW. The NSWCDD and the LSRB may have had organizational interests in expediting this approval and discouraging competing alternatives, independent of operator desires.

On the other hand, the CHPLD with its unique multi-source design was built from the ground up to be a non-lethal “dazzler,” a term for which it possesses the trademark. Its four parallel beam design, large aperture, large spot on target, and minimization of potentially injurious peak energy spikes had eye engagement in mind from the inception of the product. As will be seen, in coming paragraphs, the pointer by its very specific point source design cannot be optimized in the same way. This favored treatment of BE Meyers by Naval institutions including MCCDC, JNLWD, NSWCDD, and the LSRB would constitute non-competitive practices. It also has led to the mass-purchase and fielding of a less operationally capable and less safe NLW capability.

(b) Vendor perspectives on JNLWD/MCCDC organized AFRL testing

MCCDC’s proclamation of preference for the GBD-IIIC without defensible justification raised concern with Advocate’s and operators alike. In addition to the concern that a potentially less effective and more hazardous capability would be fielded, there was also perception of possible non-competitive practices amongst the various participating vendors. The experiences of LE Systems will be discussed extensively in this case study since the CHPLD was specifically requested as a sole source solution by I MEF (Fwd) and II MEF (Fwd). So, this is a good point to insert the experience of another vendor whose product had participated in the AFRL side-by-side evaluation.

Xtreme Alternative Defense Systems (XADS) provided the PD/G-105 as well as the PD/G-200 to the JNLWD. Although XADS was not aware that those units were intended for a side by side evaluation at AFRL, they would in fact be employed for that purpose. Additionally, XADS provided 2 upgraded units of the PD/G-105 at its own expense for the evaluation, soon after the initial request in Aug 05. In response to the request for COTS products, XADS was not given any list of requirements, objectives, an UUNS, or any other form of documentation that might have led to an optimal candidate for the planned test.

After the testing, XADS was not provided any feedback on the AFRL test results, nor did the JNLWD return the laser units that it had provided to JNLWD at its own expense. To this day, it is unclear to XADS whether the units tested were upgraded units, or if the older, prototype units originally acquired by the JNLWD were tested. Furthermore, neither

JNLWD nor MCCDC communicated or worked with XADS to determine if the tested units could be upgraded, combined, clustered, or whether a variant could be created that would meet the requirements, requirements known to USMC but not to at least two vendors. In fact, XADS was never made aware by JNLWD or MCCDC that a selective competition had occurred. In summary, the lack of transparency that permeated JNLWD, MCCDC, and MCSC decision making observed by at least two vendors is a marked trend amongst USMC combat developers. When combined with other JNLWD and MCCDC behavior on this CHPLD topic (and separate UUNS submissions), XADS' experience reinforces an outside impression that non-competitive practices are common at Quantico.

Another consideration was the cost and size of dazzler-like devices. XADS created the PD/G-105 to be sold for around \$1k. It was the size of a large pen weighing around 79 grams, and an option for employing solar rechargeable batteries for greater suitability and availability in the future. At \$1000 each the PD/G-105 competed favorably against the \$3k to \$9k for competitive systems which were larger and heavier. While the PD/G-105 was not suited to solving the II MEF (Fwd) UUNS that demanded effectiveness at longer ranges during daylight hours, the XADS certainly would have been a candidate for many MEF missions.

In fact, XADS reports that the company has sold 200 PD/G-105 units to other customers in the DoD, including CENTCOM, SOCOM, the Army Rapid Equipping Force (REF), and the Air Force. XADS claims that field feedback which comes back to the company periodically was and remains very favorable. XADS was informed that requirements detailing specific applications would come to them in order to design and build an improved low-cost, compact, and powerful capability. While such requirements have yet to materialize from CENTCOM, SOCOM, and Army, the orders for more XADS devices continue to arrive.

XADS had designed its product in the dark with regard to MEF requirements. Still, it was selling its products to other warfighters with favorable feedback from operating forces in 2005. The JNLWD, MCCDC, and MCSC overlooked these facts in making determinations regarding non-lethal laser devices in general. It is XADS' perspective that had the JNLWD engaged all competitors in a fair effort to solve the MEF (Fwd) needs the outcome might have been a much more effective overall solution in the laser distraction capability set. Instead, XADS has come to share a widely held perception of vendors providing NLW products that fair and open competition at Quantico is stifled. In this case, the single-minded preference for the GBD-IIIC at MCCDC and JNLWD is worth a closer look by the IGMC.

(9) Department of the Navy (DoN) JAG law of armed conflict approval

On 22 Dec 05 the DoN Judge Advocate General (JAG) issued a formal opinion (Ref. 1.11.) on the use of dazzler NLWs to COMMARCORSYSCOM in a letter titled: *“Legal Review of the GBD-III Custom Dazzler and the ATC CHP Laser Dazzler.”* In its opinion the DoN JAG stated: *“The GBD-III Custom Dazzler and the ATC CHP [CHPLD] are consistent with the treaty obligations and the domestic law of the United States, as well as the requirements of international law, specifically the law of armed conflict.”*

(10) Laser Safety review Board Approval (LSRB) approval of the GBD-IIIC

On 21 Feb 06 CMDR Russ Lawry, the Chairman of the Naval LSRB, signed a letter (Ref. t.4.) of approval for the GBD-III customized laser pointer to be employed by operating forces as a non-lethal weapon. His primary reference was a technical evaluation dated 5 Dec 05 that reported on testing of the GBD-IIIIC at the NSWCCD. The approval, that will expire on 1 Mar 08, permits viewing of the GBD-IIIIC laser from beyond 72 meters with the unaided eye. A MCCDC-produced Concept of Operations (CONOPS) had also been approved by the JAG, and was referenced in the LSRB Chairman's letter. The letter stated: ***"To meet the urgent wartime need, the LSRB recommends safety approval for the use of the GBD-IIIIC under the following framework...this system shall only be used against operators of potential threat vehicles... the system shall not be used against targets within 100 meters."*** In addition to establishing a NOHD of 0.072 (km), the letter formally classified the GBD-IIIIC as an ANSI Class 3b laser.

In his 21 Feb 06 letter one comment of CMDR Lawry is noteworthy, namely: ***"Serious eye injury and permanent blindness are the consequences of viewing this laser within 72 meters with the unaided eye."*** The statement is untrue according to the American National Standard for Safe Use of Lasers (ANSI Z136.1) standards that form the basis of LSRB judgments on laser eye safety. In fact, the Maximum Permissible Exposure (MPE) specified by the ANZI is determined to be a laser power density that is only 10% of that necessary to initiate permanent eye damage. In turn, the minimum eye safe distance for a laser as defined by the ANZI as the Nominal-Ocular Hazard Distance (NOHD) is determined at the MPE power density. In simple terms, the NODH represents a distance from the laser device where the power density is only 10% of that necessary to initiate eye damage. Figure 13 below is from the ANZI Z136.1 publication and graphically illustrates on logarithmic power and time scales that the ANZI MPE standards are 1/10 of the power required for actual eye damage threatened by CMDR Lawry:

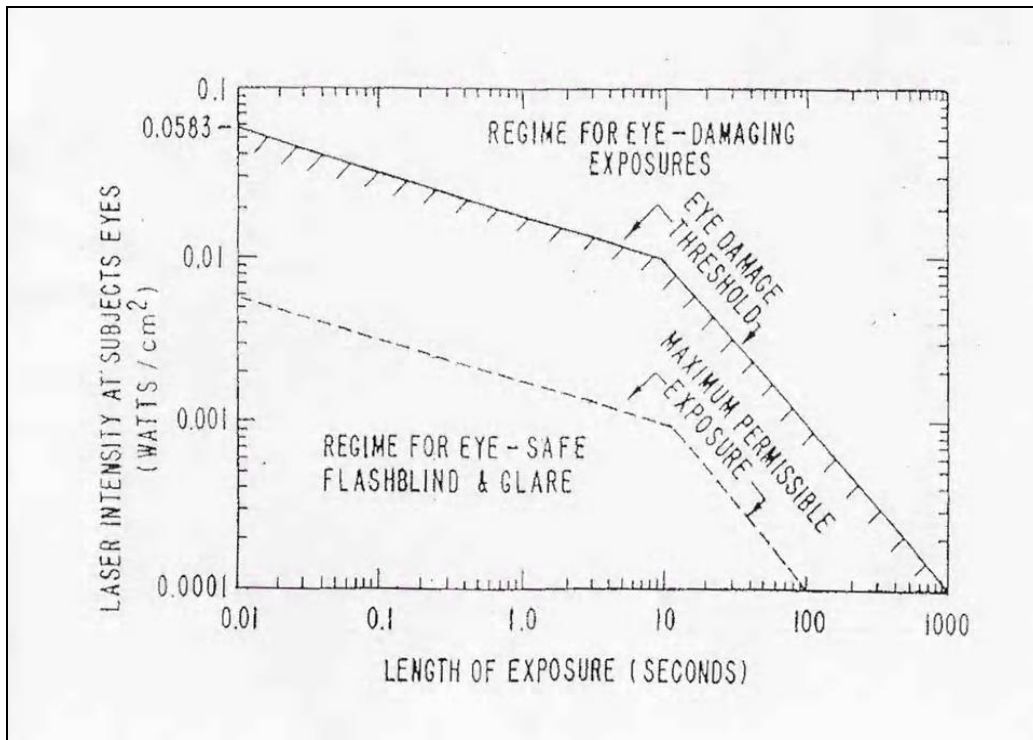


Figure 13. ANZI Z136.1 graph comparing conservative MPE to actual eye damage thresholds.

In an undated e-mail of approximately 1 Feb 06 (Ref. e.2.), a MCSC employee wrote to MCCDC, MCWL, and JNLWD defending the MCCDC and MCSC sole source of the GBD-IIIC. In it was stated: ***“Following are key comments from CDIB and Ray Grundy’s brief (Attached), both on 29 Jan 06...The CDIB decision on II MEF (FWD) JULY 2005 UUNS OIF-III-Laser Dazzlers – 05209UB: To field the II MEF (FWD) requested capability (BE Meyers GBD), because to rework the request to accommodate the I MEF (FWD) system will take about a year. It will also move the UUNS out of the urgent window and beyond the date of approved usage for this type of laser. (Note: This decision was unanimous – all CDIB reps agreed the key was to get the UUNS capability to the operating force.)...Other facts, as Ray [Grundy] briefed: Dazzlers must conform to laws of war and pass scrutiny of legal / Treaty and Laser Safety Review Board (LSRB): Also, MCSC determined that the I MEF (FWD) preferred system (CHPLD) cannot be produced by LE Systems. Also, the choice to procure the BE Meyers, GBD IIIC Laser Dazzler was made by MajGen Johnson due to its increased capability, availability (production line) and maintainability (it takes AA batteries). Pulling the plug on the BE Meyers and starting over puts funding at risk and could take an additional year to get to OIF. (By that time, II MEF (FWD) will again be in command of MNF-W).”***

This e-mail presents evidence that the FPI Branch of MCCDC CDD had possibly misrepresented the II MEF (Fwd) dazzler preferences to the CDIB on 29 Jan 06. While II MEF (Fwd) specifically requested the LE Systems CHPLD and Standard Dazzler capabilities in the UUNS, FPI apparently briefed the opposite, namely that II MEF (Fwd) had requested the GBD-IIIC. In addition to FPI’s expressed personal preference for the GBD-IIIC as early as 1 Oct 05, this CDIB misrepresentation probably contributed to biasing the CDIB towards the GBD-IIIC sole source procurement and resulted in the later MROC endorsement of that recommendation. This also makes sense when considering the fact that the CHPLD was excluded from the NSWDD testing and subsequent LSRB consideration at the same time as the GBD-IIIC was expedited through both.

(11) I MEF (Fwd) continued urgent need for the CHPLD

The expeditious sole source processing of the GBD-IIIC pointer as a NLW for use in Iraq did not impress the I MEF (Fwd) operators who were acquainted with both devices. On 28 Apr 06 Col Martin LaPierre, the Assistant Chief of Staff (A/CS) for Science, Technology and Innovation (G-9) in I MEF (Fwd) sent an unclassified e-mail (Ref. e.2.) requesting CHPLDs to MajGen Richard Zilmer, then the CG of I MEF (Fwd). Col LaPierre’s e-mail stated in part: ***“We would like to get 400 of the CHP Laser Dazzlers with the Picatinny Rail mounting rings at a cost of \$6750.00 each. We realize that the CHP Laser Dazzler is not eye safe. We will insure that the laser Dazzler is only used to draw the attention of the vehicle driver in such a manner as to cause the vehicle to slow down or stop. We do not plan to “shine it” in the eyes of vehicle drivers. The spot size on the BE Meyers is quite small and it is not able to be seen well during day light hours.”***

The author of this case study is personally aware that I MEF (Fwd) G9 was aware that the CHPLD was actually less hazardous than the BE Meyers GBD III that MCSC intended to

field. In fact, the G9, himself a technologist with postgraduate-level scientific credentials, was also aware that the multi-source aperture of the CHP was likely (and is known today to be) much safer than the GBD IIIC from the perspective of the NOHD. Still, I MEF (Fwd) G9 wanted to assure the CG, I MEF (Fwd), and eventually MCCDC and MCSC, that I MEF (Fwd) would accommodate the concerns of those organizations.

Later on 28 Apr 06, MajGen Zilmer forwarded Col LaPierre's e-mail to MajGen Catto, then COMMARCORSYSCOM, along with some additional comments. It was not until 10 May 06 that MajGen Catto responded to CG, I MEF (Fwd). While the specific contents of MajGen Catto's and MajGen Zilmer's e-mails were unclassified, no comments are provided here due to the overall classification of the e-mails as "secret." In separate correspondence later, Col LaPierre was contacted by MCSC and informed that I MEF (Fwd) would be receiving the GBD-IIIC in spite I MEF's desire to receive the CHPLD. MajGen Catto's information originated under the program management of Col Mike Mulligan, then PM over PG 13, and Maj Roper, his MCSC dazzler NLW SME. The information that Col Mulligan would have received from Major Roper and then passed on to MajGen Catto is synopsisized in Figure 13 below. It is noteworthy that the GBD-IIIC 300m daylight credible glare capability noted in the document that is attributed to Col Mulligan and was likely provided to MajGen Catto was untrue. In fact, daytime credible glare of the GBD IIIC measured at AFRL was 108 meters:

Attribute	BE Myers GBD IIIC	LE Systems CHP LD
NOHD	68 m, not eye safe	45m, not eye safe
Credible Glare/ Irradiance/ Spot Size	100 Meters: Irradiance=1177 uW/cm ² : spot size= 15 centimeters 186 Meters: Irradiance=340 uW/cm ² : spot size= 28 centimeters 341 Meters: Irradiance=100 uW/cm ² : spot size= 50 centimeters	100 Meters: Irradiance=537 uW/cm ² : spot size= 41 centimeters 186 Meters: Irradiance=100 uW/cm ² : spot size= 95 centimeters
Cost	\$8,950	\$6,600
LSRB Approved	Yes, according to Concept of Employment	No, LSRB has not reviewed
Satisfy UUNS Req	Yes, 300m daylight	No, max daytime distance = 186
Time to Field	30 days to contract award, 100 per month production, 5 months total (Oct 2006)	6 months to LSRB approval, contract award, production time (1 year, well beyond Mar 2008 deadline imposed by LSRB)

Bottom line: Neither device is eye safe, and training must include steps to mitigate potential eye damage. The GBD IIIC provides a brighter spot than the CHP at any given range, however with a smaller spot size than the CHP. The GBD IIIC should produce greater operational utility at extended ranges (341 meters+).

Figure 14. Paper extract attributed to Col Mulligan, the PM over PG 13 in 05, and perhaps 06.

(12) 1st NSWCDD Laser Safety Program (G73) test of the CHPLD

In light of continued I MEF (Fwd) pressure, Mr. Land of the JNLWD finally requested that the NSWCCD Laser Safety Program (G73) under Mr. Sheldon Zimmerman evaluate the CHPLD. According to the report, Mr. Zimmerman's co-lead investigator for the evaluation was Mary Gorschboth. Mr. Land was noted on the NSWCCD report, dated 7 Aug 06, as the ***“Responsible Authority.”*** Mr. Land and the JNLWD would be the customer of the report. The customer would then employ the results of the report to either direct or recommend to MCCDC, MCSC, and MCWL that the CHPLD be prevented or be permitted to move forward to the LSRB for an operational employment decision. This was the process that had expedited the GBD-IIIC to LSRB approval in early 06. A detailed discussion of the report is in order.

The report discussed CHPLD beam divergence: ***“The beam divergence was measured using the two-point method. The beam size was measured at two positions and the divergence was calculated from those results. The measurements yielded a divergence of the individual beams of 3.31 mrad. The maximum irradiance method was found to give an overall effective divergence of 14.3 mrad. Geometrically, an effective beam divergence of 3.7 mrad was calculated. The value used in combined calculations was 3.7 mrad.”***

The NSWCCD alleged average beam divergence calculation of 3.7 mrad raises questions. The calculated average divergence of the resonators measured at AFRL was 4.82 mrad. In fact, best of breed measurements showed an even greater divergence of 5.99 mrad in practice. In independent testing in 2007, Laser Compliance measured the beam divergence of resonators employed in the CHPLD at a minimum of 8 mrad and up to 15 mrad. All of the CHPLD resonators of the NSWCCD and AFRL test articles were made to the same standard by for LE Systems. Variances in individual resonator divergence can be expected in all diode production lines, including those observed between various GBD-IIIC and other articles. Still, the difference between and average divergence calculation of 3.7 mrad of NSWCC, the 4.82 mrad of AFRL, and the 8 mrad of Laser Compliance is a gross discrepancy that severely penalized the CHPLD.

Accuracy favors AFRL and Laser Compliance, as the lab had relied on actual measurements, and neither lab had a business or program interest in the outcome. Conversely, since NSWCCD overwhelmingly employed “simplified calculations” instead of actual power density measurements, the error would not be discovered by independent proof readers at other labs who only had NSWCCD's numbers to consider. It is also noteworthy that NSWCCD arbitrarily employed “worst case” subjectivity in the case of the CHPLD (below), calling into question the neutrality of the evaluation.

The NSWCCD report continues: ***“The total output power of the unit was measured directly using the Ophir detector and meter. Each beam has an average output power of up to 168 mW...It was decided to classify and evaluate the system based on all four beams since looking into the laser where the lasers are focused together results in an angular subtense of 1.6 mrad which is just slightly more than a(min) of 1.5 mrad...The worst case of measured or specified values were used in this hazard evaluation.”*** In selecting this gross simplification for convenience Mr. Zimmerman measured the CHPLD as a 4 X 168 mW, or 672 mW point source.

The NSWCCD decision to treat the CHPLD as a single 672 mW point source for the purposes of hazard calculations also raises questions. In the case of the CHPLD, a high average power large sized spot is created at the target due to the summation of the four individual and essentially parallel beams. This summation is referred to as the “superpositioning” of the four beams. There are several advantages to this technique that were not taken into consideration due to NSWCCD’s simplified calculations. Specifically, the peak coherent energy at any point within the area of the spot on target cannot exceed the peak energy of any of the individual laser beams that contribute to it.

This has three reasons. The first is that the spatial distribution of the sources at the CHPLD aperture will be reflected in a similar distribution down range. The second reason is that even in a worst case where the beams potentially converge into an area with the cross-section of a single beam like the pupil of the eye, the off-axis angular convergence causes partial cancellation in summation. Third, in the case of a beam intersection at the pupil, each beam will continue to travel to a spatially distinct focal point on the retina – i.e. the peak energy maximums of two or more beams cannot focus on the same point on the retina at the same moment. The fourth reason is that at the wave-length level of precision all four lasers are out of phase with each other, i.e. coherence is lost. In the end, while the individual point sources are coherent and have neat individual Gaussian energy distributions, their summation on target does not retain those characteristics in superpositioning. By treating the CHPLD as a 672 mW point source the device was severely penalized without technological justification:

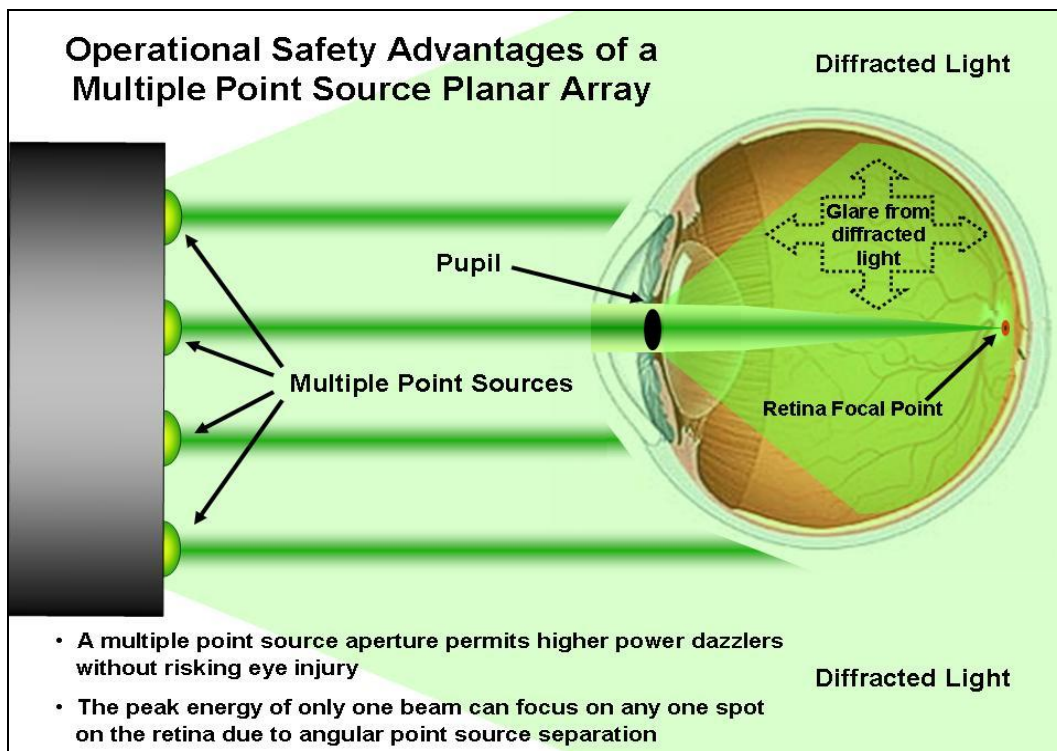


Figure 15. Given parallel CHPLD beams, energy max of only one can focus on retina.

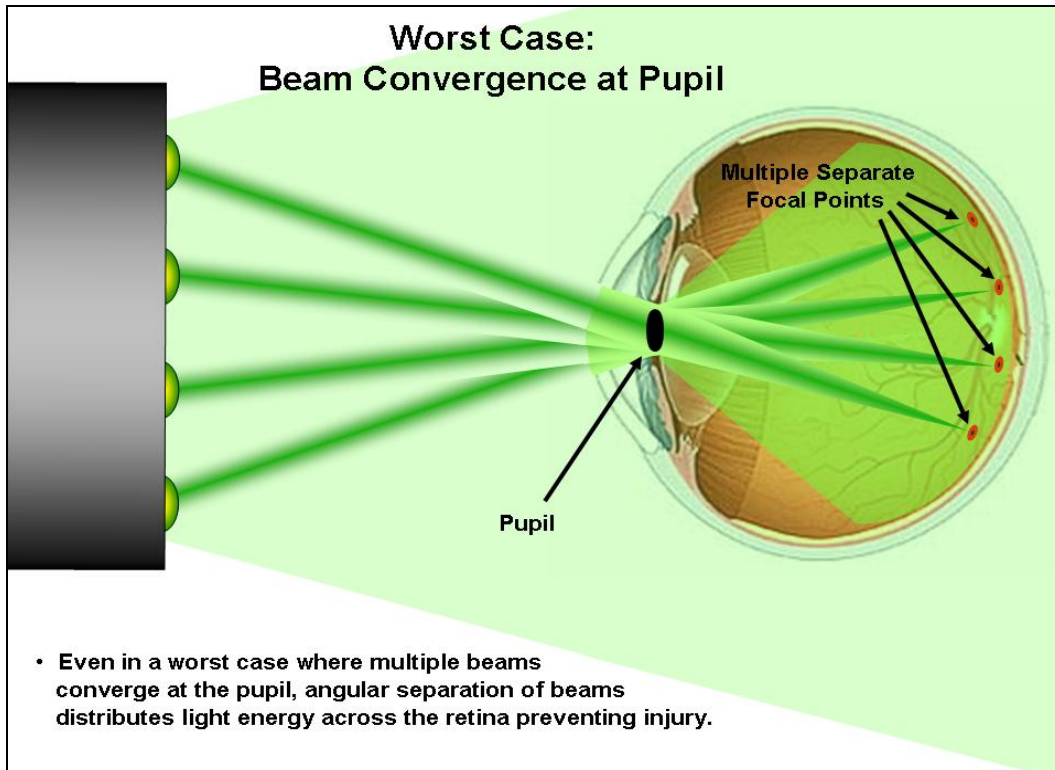


Figure 16. Given converging beams, only one can focus on any one point on retina.

A counterargument might pose that as the aperture is backed off from the eye the angular difference between the peak energy axis of the individual beams becomes less at the pupil, and the individual focal points must converge towards the same point on the retina. At an infinite distance the beams would then impact the same point, as the multi-source aperture would appear as a single point source to the eye. While this is true, in practice two issues make this phenomenon operationally irrelevant. First, the focal points are very small. For two or more focal points to come meaningfully close to one another from a thermal absorption and injury standpoint the aperture would need to be extremely far from the eye, in fact well outside of any NOHD or even useful range of the dazzler. Secondly, for such a superpositioning of focal points to have any meaning from a laser hazard standpoint the two or more superpositioned beams would have to be in-phase, i.e. coherent in their summation. The four separate beams of the CHPLD are not in phase with each other, and therefore not coherent when summed together.

Nevertheless, the NSWCCD G73 report (Ref. t.5.) concluded: ***“The CHPLD is an ANSI Class 4 and IEC class 4 laser system. The system should be brought into full compliance with the OPNAVINST 5100.27A/MCO 5104.1B and must be reviewed by the Navy Laser Safety Review Board (LSRB) prior to use. The manufacturer address must be provided on a label. The system needs to be made military exempt and labeled as such. Secondary beams are present but are not hazardous. There needs to be an armed indicator; firing is indicated by the presence of the output beam. A label marking the output aperture is needed. Camouflage labels are not required since the beam is visible, but camouflage is still recommended, depending on the use of the device. The system should require two operator actions to fire the laser (beyond inserting the batteries as one action). The firing switch should be labeled. The firing switch should be made a dead-man switch with no continuous-on***

feature. The cover burns and should be replaced with a cover that withstands the laser. There should be a means to tell the system is armed. Use of this device is not recommended with its current configuration and hazard class.” A discussion of each of the NSWCCD’s conclusions is in order:

(a) The NSWCCD conclusion that: *“The CHPLD is an ANSI Class 4 and IEC class 4 laser system”* was erroneous. The CHPLD tested by NSWCCD was in fact a Class 3b device in accordance with the qualities and power outputs of its four individual point source diodes, each of which was well below the 500 mW threshold of a Class 4. Again, an accurate evaluation can be found in AFRL’s reporting of 2005, namely: *“The...CHPLD contains four lasers that have output parameters that classify the device as a Class 3b laser according to the ANSI Z136.1-2000 American National Standard for Safe Lasers.”* Classified as a Class IV by NSWCCD, the CHPLD was severely penalized. Class IV is characterized as: *“High power lasers (cw: 500 mW, pulsed: 10 J/cm² or the diffuse reflection limit) are hazardous to view under any condition (directly or diffusely scattered) and are a potential fire hazard and a skin hazard. Significant controls are required of Class IV laser facilities.”* The CHPLD was a Class IIIB device, as stated earlier. NSWCCD’s, JNLWD’s and MCCDC’s decision(s) not to question this erroneous conclusion has not been explained.

(b) The NSWCCD concluded that: *“The manufacturer address must be provided on a label.”* This amounted to administrative minutia and did not impact the safe and effective employment of the CHPLD.

(c) The NSWCCD concluded that: *“The system needs to be made military exempt and labeled as such.”* This again amounted to administrative minutia, especially in light of the fact that NSWCCD G73 was aware that such an exception had been applied for by LE Systems. The lack of such a label did not impact the safe and effective employment of the CHPLD.

(d) The NSWCCD concluded that: *“Secondary beams are present but are not hazardous.”* Even though the statement admits that there are no hazards, Mr. Zimmerman felt compelled to include the comment. In any case, it did not impact the safe and effective employment of the CHPLD.

(e) The NSWCCD concluded that: *“There needs to be an armed indicator; firing is indicated by the presence of the output beam.”* The lack of such an armed indicator did not impact the safe and effective employment of the CHPLD.

(f) The NSWCCD concluded that: *“A label marking the output aperture is needed.”* The output aperture was extensively marked with warning labels regarding MPE etc. Also without any marking the output aperture is obvious. The lack of such marking did not impact the safe employment of the CHPLD.

(g) The NSWCCD concluded that: *“Camouflage labels are not required since the beam is visible, but camouflage is still recommended, depending on the use of the device.”* The CHPLD is flat black in color, optimal for any operating environment. This

comment was an attempt by NSWCCD G73 to guess at military requirements for which they lacked operational competencies. In any case, the lack of camouflage labels did not impact the safe and effective employment of the CHPLD.

(h) The NSWCCD concluded that: ***“The system should require two operator actions to fire the laser (beyond inserting the batteries as one action).”*** At the time of this NSWCCD comment the CHPLD required (and still requires) three operator actions to fire the laser, beyond inserting the batteries. The operator must first reverse the “Make Safe Ready for Quick Use” to engage the electrical circuit, then open the aperture cover, and finally press the trigger to fire the laser. This NSWCCD G73 conclusion had no basis in fact.

(i) The NSWCCD concluded that: ***“The firing switch should be labeled.”*** The construction of the CHPLD, as can be seen in Figure 6, has the unmistakable physical configuration of a hand gun, with a pistol grip, sighting system, and trigger. The firing switch trigger was obvious. The lack of a firing switch label did not impact the safe and effective employment of the CHPLD.

(j) The NSWCCD concluded that: ***“The firing switch should be made a dead-man switch with no continuous-on feature.”*** The lack of a dead man switch did not impact the safe and effective employment of the CHPLD, which was always employed with the optional remote cable to the finger trigger on the pistol grip.

(k) The NSWCCD concluded that: ***“The cover burns and should be replaced with a cover that withstands the laser.”*** At the time of this comment the CHPLD plastic covers were already being installed with anodized aluminum discs.

(l) The NSWCCD concluded that: ***“There should be a means to tell the system is armed.”*** This was a repeated comment. Again, a lack of an armed indicator did not impact the safe and effective employment of the CHPLD.

(m) The NSWCCD concluded that: ***“The system should be brought into full compliance with the OPNAVINST 5100.27A/MCO 5104.1B and must be reviewed by the Navy Laser Safety Review Board (LSRB) prior to use.”*** As will be seen below, those areas in which the CHPLD test article that NSWCCD had in its possession were hardly out of meaningful safety compliance with the MCO from an operator’s perspective. The CHPLD lacked labels and other minutia that the NSWCCD technicians considered important, but none that impacted the safe and effective employment of the device. NSWCCD G73 simply ran down a OPNAVINST 5100.27A/MCO 5104.1B-based check list of mostly administrative criteria, and wholly inappropriate for a COTS capability being urgently pulled on by operators. At the same time the evaluation down-played the most important aspect of safety (i.e. NOHD) and of effectiveness (daytime glare range and spot size on target).

As for making corrections identified in the evaluation, the vendor would have to be in receipt of the NSWCCD report in order to understand what improvements were required to respond to the urgent need. This was the responsibility of the “Responsible Authority” of the JNLWD customer. Similarly, the conclusion that the CHPLD must be reviewed by the LSRB did not motivate action at the JNLWD, either in the form of scheduling the CHPLD for the LSRB or in making a recommendation to MCCDC, MCSC, or MCWL that they should bring it

forward. The JNLWD would point to such a request being the responsibility of the Service. Yet, the documented close coordination of JNLWD's dazzler SME with MCCDC, MCSC, MCWN, and NSWCCD throughout the process of GBD-IIIC acceptance and CHPLD rejection contradicts the JNLWD assertion.

In closing, the NSWCCD recommended that: ***“Use of this device is not recommended with its current configuration and hazard class.”*** In light of the administrative, operationally irrelevant, and in some cases technically erroneous concerns raised in the conclusions above, the abrupt recommendation rejecting use of the CHPLD was questionable. No reasonable case had been made by the investigators that the device was not unsafe for use by Marine possessing common sense who are faced with the lethal alternatives, especially when the commander who specifically “urgently” requested it was also authorized to balance risks. Instead, it appeared that every opportunity to discredit the CHPLD was taken by NSWCCD G73, even if the arguments were weak. In fact CHPLD possessed a safer NOHD to the GBD-IIIC, even using Dahlgren's flawed penalization of the CHPLD by treating the four-source device as a pulsed, 672 mW single point source. The shorter NOHD of the CHPLD should have been the pivotal safety figure of merit for the NSWCCD G73 when balancing dazzler risk against military utility. The priorities and motives of NSWCCD G73 report was therefore questionable.

(13) NSWCCD and JNLWD dissemination of the CHPLD evaluation

On 23 Aug 06 Mr. Sheldon Zimmerman disseminated his CHPLD-dismissive report to his Air Force and Army laser safety counterparts, as well as his superiors. He did not send it to the CHPLD vendor for corrective actions, evidently leaving that to the customer of the report. The next day NSWCCD delivered the report to Mr. Land at JNLWD.

On 24 Aug 06, Mr. Land further disseminated the report to other JNLWP personnel. In his comments (Ref. e.2.) he stated: ***“Team, For your amusement and edification, the draft hazard assessment for the “production” run LE Systems CHP Laser Dazzler is attached. It seems the NOHD is other than had been reported by the manufacturer. Enjoy....”*** (underline emphasis by the author) The openly skeptical, in fact cynical tone of Mr. Land's e-mail was consistent with the GBD-IIIC protective/CHPLD-dismissive attitude of the Quantico combat development and Dahlgren testing organizations that had been involved with lasers as NLWs, ever since Mr. Grundy's GBD-IIIC sole source intention e-mail of 1 Oct 05.

Additionally, Mr. Land's e-mail (2. e.1.) reveals that he did not scrub the report before hastily disseminating it widely. In so doing he overlooked the flawed point source treatment of the CHPLD at NSWCCD, and the other technical deficiencies of the report. He also accepted the report conclusion that the NOHD of the CHPLD was much greater than the 20 meter “MPE” distance label that the manufacturer stated, and thereby implied the vendor had been less than truthful. As for the veracity of LE Systems' technical claims, on 24 Sep 07, the CHPLD was the subject of an independent test of by Laser Compliance. That independent testing employed measurement, and revealed that the CHPLD actually has an NOHD of 29 meters based on the ¼ second blink reflex. Even in the case of an operationally unrealistic 10 second exposure the CHPLD was found to possess an NOHD of 45 meters. Mr. Land's evident zeal in spreading questionable information without further technical scrutiny, arguably his charter as a paid JNLWD government civilian, was suspect. Considering Mr. Land's

government position and technical qualifications, his comment on NOHD reasonably be considered to be slanderous.

With his cynical “production” he also implied to others that the CHPLD was not mass producible, a further proliferation of derogatory production comments begun by Maj Roper of MCSC the year before following his trip to view the CHPLD operator demo at Camp Lejeune, NC. On the date of Mr. Land’s e-mail though, no representative of MCCDC, MCSC, JNLWD, MCWL, or NSWCCD G73 had yet visited the facilities of LE Systems or its subcontractors to qualify such judgments. Many operators perceived this e-mail and the NSWCCD G73 rejecting the CHPLD as an effort to stifle its competition against the expedited GBD-IIIC. It is noteworthy that in coming months the suggestions of Mr. Land would be disproved. In Nov 06 I MEF (Fwd) open purchased 28 CHPLDs from LE Systems. Within seven weeks of contract award LE Systems had shipped all 28 ordered systems. In fact, most of the CHPLDs were delivered to I MEF (Fwd) before the first GBD-IIIC was signed for on 1 Jan 07. Prior to I MEF (Fwd)’s open purchase, LE System had already delivered nine CHPLD’s to ARSOC. Since I MEF (Fwd)’s purchase LE Systems has delivered 28 CHPLD’s to the Department of State and another 14 CHPLDs to Army MPs operating in Iraq. Again, considering Mr. Land’s government position and technical qualifications, his comment on NOHD reasonably be considered to be slanderous.

In spite of Mr. Land’s willingness to disseminate the report liberally, he did not provide the report or a list of the observed deficiencies to the vendor, even after repeated requests by LE Systems. When this denial of information is combined with his evident decision not to encourage USMC or JNLWD to get the CHPLD scheduled for the LSRB, concerns are raised. It would have been the responsibility of the customer of the report (JNLWD) and the “responsible authority” (Mr. Land) to make all necessary arrangements for the report to be given to LE Systems for corrective actions recommended in the report. This was especially so considering the warfighter pull on the CHPLD. If further permissions were required (such as from NSWCCD), it would have been Mr. Land’s responsibility to immediately obtain those permissions, again given the urgency of the operator pull on the CHPLD. Mr. Land apparently made no arrangements to have the evaluation data approved for the vendor to allow timely product correction.

It can be presumed that as a scientist, Mr. Land was the premier technical subject matter expert on non-lethal lasers at the JNLWD. It is also reasonable to assume that Mr. Land was the most highly qualified laser SME amongst the other dazzler-interested parties at Quantico, including MCCDC, MCSC, and MCWL. The USMC and JNLWD actions that would follow the customer’s receipt of the report would therefore either be authorized or recommended by Mr. Land in his expert capacity. As will also be seen, Mr. Land neither made arrangements to bring the CHPLD before the LSRB nor recommend to MCCDC or MCSC that the CHPLD be brought before the LSRB. The fact that schedule CHPLD for the LSRB caused severe delays and had direct and tragic operational consequences, as the lack of LSRB certification prohibited the CHPLD’s use.

More so even that the evident technical shortcomings of the NSWCCD G73 eval and the preferences expressed by the investigators, the lack of JNLWD communication and action with the vendor on this visible program generated significant concerns at I MEF (Fwd).

In a 24 Aug 06 e-mail (Ref. e.2.) to Mr. Land regarding the first Dahlgren evaluation of the CHPLD, the PP&O Science Advisor who was preparing to deploy to Iraq, commented on the report: ***“One...observation is problematic here. Dahlgren did this evaluation. Dahlgren also has proposed its own dazzler system or configuration of dazzlers for Sheriff and other applications...That means they have an institutional interest in the outcome...were they the right organization to be asked for a neutral government opinion under these circumstances? Were truly neutral operational testers involved in an observer capacity, or even informed and asked for independent perspectives on what Dahlgren was doing...?”***

In an e-mail (Ref. e.2.) response these concerns were dismissed by Mr. Land. Excerpts of his response e-mail included: ***“...I believe your concern is misplaced...The folks that did the assessment are the lab designated by the Navy Laser Safety Review Board (LSRB). Sheldon Zimmerman oversaw the tests and is a member of the LSRB...The NSWC-DD folks were...brought in after a selection had been made by requirement of the LSRB...The FSEP [Sheriff] program...has switched to a vehicle powered version of the GBD-IIIC for deployment.”*** The response from Mr. Land revealed several pertinent points. First, he confirmed that there was indeed a programmatic connection between NSWC Dahlgren and the GBD-IIIC. Second, it revealed that the Dahlgren tester of the CHPLD, and presumably the GBD-IIIC as well, was simultaneously serving as a member of the LSRB. Finally, Mr. Land confirmed that the LSRB, on which Dr. Zimmerman participated, not only approved and disapproved candidate lasers, but also selected the labs at which they were to be tested. In spite of Mr. Land’s denial, a possible NSWCCD G73 conflict of interest and a general lack of neutral LSRB oversight were both confirmed, a perception that would be reinforced in 2007.

Later, the PP&O Science Advisor asked Mr. Land for the particulars of the CHPLD he had been provided for transport to Iraq, vis-à-vis the NSWCCD report. Reinforcing the view that Mr. Land possessed an evident bias against the CHPLD, Mr. Land responded (Ref. e.2.): ***“Consider this report to be representative of the effects and hazards of the device you possess, vice manufacturers propaganda. NSWC-DD and MCWL will be addressing the issues identified with the manufacturer directly”*** (underline emphasis by the case study author). Note that in this response that Mr. Land also provided assurances that NSWC-DD and MCWL would contact the vendor with the test results: ***“NSWC-DD and MCWL will be addressing the issues identified with the manufacturer directly.”*** This contact did not occur, and there was no follow-up from the JNLWD, i.e. the ***“responsible authority”*** for the NSWCCD report product. The ***“manufacturer’s propaganda”*** comment of Mr. Land represented just another slanderous remark, the motivation for which should be fully investigated by the IGMC.

In a separate e-mail to Maj Roper at MCSC, forwarded to Mr. Doug Jerothe, the Deputy Director of the JNLWD on 24 Aug 06, Mr. Land, representing a Joint program office made a source selection recommendation to the USMC, a questionable role for his charter. His e-mail message containing wording to Roper that was strikingly similar to Mr. Grundy’s incomprehensible e-mail endorsement of the GBD-IIIC on 1 Oct 05. Mr. Land’s choice of enthusiastic wording in the endorsement sentence (Ref. e.2.) was in fact identical to that

employed in Mr. Grundy’s old communication, namely: ***“Based on the AFRL/HEDO review and my understanding of the requirements, my hands down recommendation would be the B.E. Meyers GBD-III Custom Laser Dazzler”*** (underline emphasis by the case study author). This time the confident assertion came from Mr. Land, a JNLWD official who, unlike requirements officials at MCCDC, was specifically hired and expected to exhibit both superior technological competence and objectivity.

In this e-mail Mr. Land again raised doubts in the CHPLD for which there was and is no evidence. He stated: ***“The next best by a considerable margin would be the ATC CHPLD, manufactured by LE Systems...”*** The question can be asked, what were the metrics for this margin, and who validated those metrics? This statement is reflective of a dazzler issue trend at JNLWD, MCCDC, and MCSC, namely that personnel made up their own purely subjective determinations of performance. The e-mail continued: ***“...the system is powered by Lithium batteries and there were questions raised by the test facility regarding quality control in the production process.”*** A true subject matter expert like Mr. Land would have done thorough research and discovered that the CHPLD’s Lithium Batteries had already been approved for use by NAVSEA in 2005. ***“Some of the quality control issues can be illustrated by the variation on power output of the four laser elements that comprise the CHP system.”*** Again, a true subject matter expert such as Mr. Land would have carefully evaluated test data prior to making comments on quality control, or validating the comments of others. Variances in the laser outputs of the GBD-III test articles provided to the Army Center for Occupational Health and Preventative Medicine for testing in Nov 05 were reported in Reference t.9. They were 150mW, 201mW, and 235mW, respectively. This represents a 36% power variation between individual diodes from three sample articles. The output of the GBD-IIIC test article at AFRL was measured at 204mW. The laser of the GBD-III (Custom) at AFRL and those of the three GBD-IIIs tested by Army all constituted the same laser product line sources, less the diffuser on the Army “uncustomized” articles:

GBD III	SN 10732	SN 10733	SN 10734
Wavelength	532 nm	532 nm	532 nm
Total Power	201 mW	235 mW	150 mW

Figure 17. Test article power extract from USA Center for OH and PM test of GBD-III.

However, the variance in laser power outputs of the four individual sources in the CHPLD test article measured at AFRL, Brooks AFB constituted only a 16% variation between highest and lowest power output. In addition to this evidence of the CHPLD’s lower individual laser power variance, it is the average summation of light on target that counts in practice. Therefore, the individual laser power is irrelevant with regard to effectiveness of any multiple laser device. This lesser individual laser output variance combined with the ‘smoothing’ effect of laser summation on target proved the power output stability of the CHPLD was actually superior to the single laser source-dependent GBD-IIIC. ***“Production rates and capability are also a factor.”*** The credibility of Mr. Land’s production rate and capability doubts are also questionable. On the date of this e-mail is date no representatives from MCCDC, MCWL, JNLWD, or MCSC had yet visited LE Systems facilities to justify this comment. Seen in context

of other unqualified comments that cast doubt on the CHPLD, an observer might conclude that this JNLWD e-mail was an effort to bias the outcome in a way intended to stifle competition. LE Systems production facilities were apparently first visited by MCSC on 26 Jan 07, and this contention should be investigated by the IGMC.

As such, Mr. Land would have been reasonably expected to inspect all test results meticulously and objectively, whether they were generated at AFRL, Dahlgren, or some other facility. He would also have been professionally obligated to bring to the attention of decision makers serious errors or omissions in testing, and to be able to identify conflicts of interest. In light of his charter and his technical credentials, Mr. Land's decision not to identify the shortcomings of Dahlgren's testing or to qualify the fundamental design differences between, and operational advantages of the CHPLD over the GBD-IIIC raised questions within I MEF (Fwd).

(14) Renewed I MEF (Fwd) efforts to solve the Dazzler need with CHPLDs

On 24 Aug 06 the S&T Advisor to DC, PP&O wrote the following e-mail (Ref. e.2.) to MajGen Zilmer and Col LaPierre: ***"I have signed for and am preparing to ship FEDEX 2 powerful, wide aperture LE Systems CHP dazzlers to your location so that your Marines can compare them with the BE Meyers GBD-IIIC that MCCDC is apparently pursuing as a sole source. FYI, JNLWD had recently given a CHP to MCWL for them to take to I MEF (Fwd) for the same purpose, but this MCWL action was stopped by the NLW folks at MCCDC HQ. So, I now have from JNLWD 1 CHP and 1 BE Meyers, and last night LE Systems provided me a second CHP. I was about to ship when [others] advised me to engage you before we get completely out of sync with MCCDC."*** The GCE S&T Advisor had by that received authorization to report to I MEF (Fwd) in order to serve as the Science Advisor to CG, I MEF (Fwd). The two CHPLD's and one GBD-IIIC were to be hand-delivered to I MEF (Fwd) in order to facilitate side-by-side user evaluation of the two devices as a part of operational experimentation.

In response to the news that the candidate lasers were enroute, on 28 Aug 06 MajGen Zilmer wrote (Ref. e.2.) to LtGen Amos and asked him to assist in allowing the CHPLDs and GBD-IIIC to be sent to Iraq. The PP&O S&T Advisor was Cced: ***"...Need a quick assist to get these 'possible' options over here for comparative testing. Have been working this now for 7 months trying to get some additional tools over here to help with EOF mitigation techniques. Understand that some issues still remain WRT employment. That said, we will fully comply with appropriate protocol in trial testing of these systems. Have an opportunity to send now and would suggest we do so. Want to make sure everybody is on board and understands our need to get something working over here relative to visual warning. Have included one e-mail with background."*** Prior to departing for Iraq, the S&T Advisor was prohibited from taking the dazzlers to Iraq by Col Jack Wassink, the advisor's supervisor at PP&O. Personnel within the Force Protection Integration (FPI) Branch of the MCCDC CDD were vociferously opposed to allowing the CHPLDs being delivered to I MEF (Fwd). They had placed significant pressure on Col Wassink to support their alleged safety concerns regarding the CHPLD, the product they had prohibited from proceeding to the to the LSRB. The individuals opposed to deployment were Col Oltman, the Branch Head and his deputy, Mr. Grundy. As noted earlier, Mr. Grundy had preselected the GBD-IIIC, and recommended it for sole source

procurement in 2005. If the operators in theater were to discover that the CHPLD might be a preferable capability this would conceivably disrupt the FPI Branch, JNLWD, and MCSC way-ahead. That way-ahead may have included a \$7M earmark intended for BE Meyers, to procure GBD-IIIC in coming years.

On 8 Sep 06 the Science Advisor to I MEF (Fwd) sought to rapidly fulfill MajGen Zilmer's intent. He wrote an e-mail (Ref. e.2.) to Col Tim Bruton who served as the G-9 of I MEF at Campen, CA. ***"We need the dazzler systems that [we] have signed for. Please encourage PP&O to ship them to me at Camp Fallujah now. The CG wants them as per the below e-mail...We will abide by all legal and safety constraints, as per Gen Zilmer's 28 Aug e-mail below. The POCs for getting the package shipped out are 1. Col Wassink (Branch Head PLI), 2. Mr. DeWeese (Plans EA), and 3. Col Armel (DC, PP&O EA). All are cced here."***

On 13 Sep 06 Col Bruton responded (Ref. e.2.), writing in part: ***"I spoke with [Branch Head, PLI in PP&O] and there is a concern about LtGen Amos' answer to MGen Zilmer's question. Did LtGen Amos say that he was in support of the CHP Dazzler being shipped as requested? If so, it will be sent immediately; if not, we need to take this to LtGen Mattis, Amos and LtGen Huly to get immediate resolution. Gen Mattis should be available."***

In response, on 13 Sep 06 the Science Advisor to I MEF (Fwd) wrote another e-mail (Ref. e.2.) to the G-9 of I MEF at Campen, CA. An excerpt included: ***"...MCCDC NLW Program does not want the Marines of I MEF to realize that the operational effectiveness of the more powerful CHP dazzler might be preferred to the BE Meyers GBD III that the MCCDC NLW Program selected as a sole source. The sole source decision was done without any side-by-side user operational experimentation, and the results of such a comparison might be embarrassing to MCCDC Force Protection folks. They have successfully influenced PLI and SYSCOM through "safety concerns"...We say, and have said, let the users decide which is preferred, and let the MCCDC and SYSCOM programmatic chips fall where they may, and lets do this quickly for the Marines sake. II MEF (and now I MEF) have asked specifically for the CHP in the [II MEF Fwd] UUNS for a reason – it is predicted to be significantly more effective as it is more powerful, has a larger aperture, and has a larger diameter spot size at range."***

This e-mail and the chain that preceded it were quickly elevated to the attention of DC, CDI, LtGen James Amos. On 13 Sep 06 LtGen Amos directed CG, MCWL to get to the bottom of the dazzler issue. DC, PP&O, Deputy COMMARCORPSYSCOM, CG, I MEF, and CG, I MEF (Fwd) were all included as Ccs. Excerpts of his e-mail (Ref. e.2.) to CG, MCWL include: ***"...I need ground truth on how we ended up choosing the [BE Meyers] dazzler vice the CHP one?...was the CHP one even considered?...what communication was made between I MEF FWD and us back here wrt to the [BE Meyers] dazzler? I have been there and fully understand how UUNS come about and how they leave the forward command....so I have a sympathetic bias towards our brothers and sisters forward. That said, our end deals in taking monies out of other programs to fund UUNS...that is life and I am more than willing to make those decisions along with MCSC....but we have to be fiscally responsible as we do this. I need ground truth here and I need it today please."***

Responding to DC, CDI's RFI, in an e-mail on or about 13 Sep 07, Mr. Barry Dillon, the civilian Deputy to COMMARCORSYCOM, wrote (Ref. e.2.) to LtGen Amos justifying the MCSC decision to go forward with the procurement of the GBD-IIIC and forego approval of the CHPLD. Carbon copy addresses included DC, PP&O and CG, I MEF (Fwd). Excerpts include: ***“Attached is fact sheet that provides you with the history surrounding this UUNS, answers to your questions, and my recommendation. MROC UUNS on Laser Dazzlers being processed for approval has it right [i.e. procure and field the GBD-IIIC]...I have included the COMPACT HIGH POWER LASER DAZZLER LASER SAFETY EVALUATION dtd 7 Aug 06 for the LE Systems (CHPLD). I would draw your attention to the recommendations on page 12; specifically, “The system should be brought into full compliance with the OPNAVINST 5100.27A/MCO 5104.1B and must be reviewed by the Navy Laser Safety Review Board (LSRB) prior to use.” and “Use of this device is not recommended with its current configuration and hazard class.”***

Comments on Mr. Dillon's e-mail above: CHPLD being brought into full compliance meant labeling minutia for the most part, nothing that would preclude safe operation; CHPLD being brought into full compliance with the OPNAVINST 5100.27A/MCO 5104.1B would have required that JNLWD, SYSCOM, and MCCDC share the Dahlgren evaluation of CHPLD with LE Systems. However, in spite of repeated requests, the manufacturer was refused the NSWCCD report. This was perceived by many, including I MEF (Fwd) staff, as a competition stifling practice at MCCDC, MCSC, MCWL, and JNLWD. This was especially true in light of the accelerated pace of GBD-IIIC approval at the LSRB and the sole source GBD-IIIC procurement, the intention of which was already announced by Mr. Grundy on 1 Oct 05. Documents available to the author of this case study appear to indicate that the fact that the CHPLD was not forwarded to the LSRB following the Dahlgren testing was the result of a coordinated decision of MCCDC FPI Branch, MCSC, and JNLWD action personnel.

Further comments on Mr. Dillon's e-mail above: Highlighting of the ***“hazard class”*** determined by Dahlgren: In Sep 05 and again in Nov 05 AFRL had correctly determined that ***“The...CHPLD contains four lasers that have output parameters that classify the device as a Class 3b laser according to the ANSI Z136.1-2000 American National Standard for Safe Lasers.”*** The Dahlgren report of Aug 06 referenced by Mr. Dillon incorrectly stated: ***“The CHPLD is an ANSI Class 4 and IEC class 4 laser system.”*** The Class 3b vs Class 4 distinctions are critical, and revealed the flawed nature of Dahlgren's so-called ***“simplified”*** calculations. SMEs at MCSC, MCCDC, and JNLWD consciously elected to withhold this and other questionable data on performance contained in the Dahlgren report from their supervisors. This erroneous and incomplete information was proliferated to the leadership of MCSC, MCWL, and ultimately MCCDC, and helped justify LtGen Amos' decisions.

Approximately concurrently with Mr. Dillon's e-mail, on or about 13 Sep 06 Col Jeffrey Tomczac, Chief of Staff of MCWL, sent to LtGen Amos his own justification (Ref. e.2.) for GBD-IIIC procurement decisions and rejection of the CHPLD. Excerpts include: ***“...I believe the right decision has been made in regards to fielding the BE Meyers GBD III over the LE Systems CHP LD. To date, the available information provides a compelling argument that supports the decision...It is my recommendation that we stay the course...”***

Col Tomczac's e-mail (Ref. e.2.) continued: ***“The following is a summation of information I have collected from several papers/email: [GBD-IIIC] Meets UUNS requirement daylight 300M...[LSRB] and Treaty approved...Time to field: 30 days to contract award, 100 per month production, 5 months complete fielding...Approved by CDIB...Army is currently procuring...”*** Comments on this section: GBD-IIIC did not meet 300 meter daylight requirement, rather AFRL measured 108 meters (CHPLD was significantly superior at 186 meters); In spite of LtGen Amos' decision to go with the GBD-IIIC upon receiving Tomczac's e-mail, the first GBD-IIIC was not signed for by a user in Iraq until 1 Jan 07; The CDIB approval of the CHPLD had been suspect since Mr. Grundy had announced his intention to favor and sole source the GBD-IIIC on 1 Oct 05, in contradiction of all AFRL data comparing GBD-IIIC and CHPLD (the only test data existing at that time), leading directly to the CHPLD's exclusion from both Dahlgren evaluation and the LSRB prior to 29 Jun 06 CDIB decision.

Tomczac's e-mail (Ref. e.2.) continued: ***“[The] L.E. System, CHP Laser...Does not meet UUNS requirement, max daytime distance 186M...No [LSRB], Legal and Treaty approval...No funding identified...Time to Field, assuming funds available is minimum of 6 months to get Laser Safety Review Board, another month for contract award, and unknown production capability...No Statement of Need”*** Comments on this section: CHPLD at 186 meters was significantly superior to GBD-IIIC at 108 meters; Deliberate exclusion of CHPLD from concurrent Dahlgren and LSRB evaluation was a competition-stifling decision of MCCDC; Legal and treaty approval of CHPLD was achieved in the same documents as the GBD-IIIC; Funding could have been reprogrammed from several MCCDC, MCWL, and MCSC NLW programs; Delays of LSRB, contract, and production all proved to be results of deliberate CDIB decisions or MCCDC NLW misinformation regarding LE Systems production capabilities; Lacking SON again a deliberate CDIB issue, especially when the II MEF (Fwd) UUNS and later the I MEF (Fwd) UUNS specifically requested the CHPLD.

Tomczac's e-mail (Ref. e.2.) continued: ***“Background Info: CDIB unanimously recommended on 29 June 06 that the MROC approve the acquisition and fielding of the BE Meyers solution. The following chronology and related issues are provided as info: * Laser Dazzler UUNS - 05209UB received from II MEF on 28 July 05 * MCCDC & II MEF coordinated Concept of Employment (COE) for a Laser Dazzler Capability (17 Nov 05) * BE Meyers GBD-IIIC Laser Dazzler passed Legal Review (22 Dec 05) based on the COE articulated by II MEF * BE Meyers GBD-IIIC Laser Dazzler was approved by the LSRB (21 Feb 06) and is ready for production and fielding * LSRB authorized period for use of the BE Meyers Laser Dazzler through March 08.”***

Tomczac's e-mail (Ref. e.2.) concluded with: ***“* Cancelling BE Meyers GBD-IIIC Laser Dazzler and restarting the solution development process places \$3.8M at risk. * The CHP Laser Dazzler to date has not passed the LSRB. The CHP Laser Dazzler production capability is questionable. It is doubtful that MCSC can field the CHP Laser Dazzler to I MEF before March 07 and the I / II MEF rotation. * Pending MROC approval the fielding of 400 BE Meyers systems will start in the first quarter of FY-07.”***

This erroneous information was proliferated to the leadership of MCSC and MCWL by JNLWD, MCCDC, and SYSCOM dazzler SMEs as the leaders sought to gain an

insight into the dazzler issue in support of DC, CDI. Ultimately, the information was passed to DC, CDI and was employed by LtGen Amos to justify his decision. First, the funding would not have been placed at risk if it had been employed to fund a sole source open purchase of CHPLDs. Also, the reason the CHPLD had not been to the LSRB was that the JNLWD, the customer of the 1st NSWCCD evaluation report, did not recommend or press for the CHPLD to be seen by the LSRB. It is noteworthy that Mr. Sheldon Zimmerman, the investigator who authored the NSWCCD G73 report, also sat on the LSRB as a member.

Finally, at the time of Tomczac's LE Systems "production capability" concern no member of MCSC, MCCDC, MCWL, or JNLWD had ever been to visit LE Systems or LE Systems' subcontractor production facilities. When NSWCCD and MCSC personnel did finally visit many months later they were favorably impressed.

Having all of the above information presented to him by MCWL, MCSC, and MCCDC staff, on or about 13 Sep 06, in an e-mail (Ref. e.2.) to the CGs of I MEF and I MEF (Fwd), LtGen Amos wrote: ***"...I am authorizing the immediate purchase of the BM dazzlers to prevent putting \$3+M at jeopardy at this late date in the FY. Additionally, the attachments show that the CHP is not LSRB approved as yet and thus I am not willing to send it into theater at this point. Find below summaries of what we have to date. I intend to continue to have my guys track the CHP and when it is ready for prime-time I will have [CG, MCWL] coordinate a side-by-side assessment of the BM system and the CHP system. You should begin to start receiving the BM dazzlers shortly."***

LtGen Amos made his decision after weighing all of the information that had been provided to him from SMEs and managers. He trusted that the information provided to him regarding the two candidate systems was technically accurate and unbiased. He also made his decision to provide a basic capability to I MEF (Fwd) as soon as practical, leaving open the possibility that his desired future side-by-side user comparison of the two systems could yield a different result. His intent (Ref. e.2.) was for MCCDC and MCWL (and JNLWD as a central expert component of the NLW team) to: ***"...track the CHP and when it is ready for prime-time I will have [CG, MCWL] coordinate a side-by-side assessment of the BM system and the CHP system."*** As will be seen, this guidance was not followed by MCCDC, MCWL, or MCSC with JNLWD SME inaction a central cause.

On 3 Oct 06 the President of LE Systems (Mr. Titus Casazza) wrote an e-mail to Mr. Land inquiring about the two CHPLDs that LE Systems had loaned to the JNLWD in the Jul-Aug 06 timeframe. Mr. Casazza's e-mail (Ref. e.2.) stated in part: ***"It has been about 2 ½ months since I sent the two CHPs to you. Can you give me any information as to the status of, or results from the evaluation? If there is anything I can do to assist in the process please call or e-mail me."*** Even though this direct e-mail request included carbon copies to MCCDC, MCSC, and MCWL, LE Systems continued to be denied the report.

(15) Northrop Grumman Corporation (NGC) "Project 208"

During the month of Oct 06 Mr. Land brought to the attention of the I MEF (Fwd) Science Advisor an industry project that JNLWD had apparently invested in. It was called

Project 208, and belonged to the Northrop Grumman Corporation (NGC). It was a visible laser illuminator technology based on a patent-pending technique called “*Holographic Optical Radiator for Neutralizing Enemy Troops (HORNET)*.” According to a fact sheet provided for this case study, a vehicle-mounted HORNET configuration had once competed to be the dazzler component solution to Project Sheriff in 2005. The same fact sheet states that hand-held configurations of HORNET technology were apparently being sponsored by USG and developed at NGC for experimentation during operations “overseas” (presumably in OEF or OIF).

By itself, this information was encouraging, namely that JNLWD might have been at looking at earlier operational experimentation with a new dazzler concept. However, of concern were the two key characteristics of the hand-held HORNET dazzler, a device that appeared to be similar to the CHPLD in principle. The 0.5W output power and the employment of a hand-held multiple-source planar array at the aperture of the developmental HORNET was in principle identical to COTS CHPLD. Yet, if it was USG-sponsored (and Mr. Land gave indications that it was a JNLWD-sponsored project), Project 208 would appear to have circumvented standard Federal Acquisition Regulation (FAR) Request for Information/Proposal (RFI/P) procedures. No RFI or RFP relating to S&T, R&D, or an operational gap conceivably calling for a HORNET-based dazzler were known to have been issued by JNLWD or MCSC to initiate an award for “Project 208,” if it was in fact funded by USG. Additionally, neutral vendors, who have asked not to be named, have noted to the author that JNLWD may have asked NGC to take the characteristics of the CHPLD and apply them to its technology, based on comments overheard by third parties at trade and technical conferences. These claims cannot be verified at this time.

Currently, there is an appearance that competition-stifling practices employed by the JNLWD staff in the initiation of, or partnering in Project 208, even though this appearance cannot be substantiated by the author. Later in this case study, a similar case will be described where a third party vendor suspects that a different proprietary technology of JNLWD interest may have been transferred to a competitor, again by a member of the JNLWD staff. None of these observations can be substantiated by the author of this case study. However, the mere existence of possible patterns and suppositions should be resolved through a closer investigative look by the IGMC.

(16) I MEF (Fwd) discovery that DC, CDI’s guidance had been ignored

In spite of the sole source of the GBD-IIIC at Quantico and PLI’s refusal to send the two CHPLD’s into theater as per CG, I MEF (Fwd)’s request, MajGen Zilmer continued to desire to obtain CHPLD’s quickly to begin to reduce EOF casualties. He looked forward to fulfilling the stated intent of LtGen Amos to achieve an operationally relevant side-by-side evaluation of the two laser dazzlers under the oversight of MCWL, and in theater. Such operational experimentation would have immediate positive consequences on the ground as an initial operational capability (IOC) would be achieved in MNF-W. Another issue was that the promised GBD-IIIC’s were not being delivered expeditiously by MCSC. In fact the first GBD-IIIC would not be signed for by a MNF-W operator until 1 Jan 07. Since the CHPLD had been prevented from being considered by the LSRB when the GBD-IIIC had been seen in 2006, a

rapid LSRB approval process was anticipated on this front as well, given LtGen Amos' comments.

The NSWCCD G73 complaints regarding the CHPLD were trivial, and in terms of safety and effectiveness the NOHD of the CHPLD based on the ¼ second blink response had been measured to be superior (i.e. safer) during both AFRL and NSWCCD G73 testing (45m [AFRL] and 67.5m [NSWCCD]), versus the 72m for the GBD-IIIC). Furthermore, the AFRL testing had shown the CHPLD to be far superior to the CGD-IIC with respect to the critical daytime glare effectiveness (186m for CHPLD versus 108m for GBD-IIIC). In light of high confidence that the CHPLD would be expedited through LSRB approval, CG, I MEF (Fwd) authorized the open purchase of 28 COTS LE Systems CHPLDs using the O&M funds under his authorization. This would permit the side by side operational experimentation that the Generals wanted to proceed in-theater.

On 1 Dec 06 the I MEF (Fwd) Science Advisor wrote (Ref. e.2.) to Mr. Land of the JNLWD and asked: ***“Can you tell me the status of CHP and the LSRB? Also, what is the plan for a side by side evaluation of CHP against GBD III?”*** The I MEF (Fwd) inquiry was prompted since I MEF (Fwd) had heard nothing on the status of CHPLD LSRB evaluation since LtGen Amos issued his guidance on 13 Sep 06. The I MEF (Fwd) Science Advisor decided to contact the JNLWD again. On 4 Dec 06 Mr. Land answered with: ***“Currently there is no ‘status’ as no one is working to get the CHP before the LSRB.”*** The I MEF (Fwd) Science Advisor and the I MEF (Fwd) G-9 with whom he shared the news were concerned.

In a return e-mail (Ref. e.2.) on 4 Dec 06 Mr. Land was queried: ***“Your response does not jibe with LtGen Amos' guidance and direction [namely]... 'Additionally, the attachments show that the CHP is not LSRB approved as yet and thus I am not willing to send it into theater at this point' means that he intends for someone (presumably you) to get it before the LSRB...”*** Also, LtGen Amos' statement: ***‘I intend to continue to have my guys track the CHP and when it is ready for prime-time I will have Tex coordinate a side-by-side assessment of the BM system and the CHP system’*** means that he intends for someone (presumably you) to get a ‘head to head’ comparison, since I MEF Fwd still wants the CHP...we...still hope that you are trying to help MCCDC and the operational community [with] I MEF Fwd's unfulfilled need for larger spot size and significantly higher power. LSRB approval and a side-by-side with the BE Meyers - that was the MCCDC way ahead. That should have been guidance good enough for you and Ray Grundy to put aside your curious reflex preferences for BE Meyers, be neutral, and get on with the urgency of the need. But apparently not...Our question is why not?” This led to a heated intervention by the Director of the JNLWD who felt that his organization was being unfairly criticized.

Later on 4 Dec 05, Col LaPierre, I IMEF (Fwd) G-9 separately addressed Mr. Land directly. Excerpts from his e-mail (Ref. e.2.), which included carbon copies to II MEF, MARCENT, and Director JNLWD stated: ***“LtGen Amos promised Major General Zilmer that immediate action would be taken on this subject in September...EOF incidents are still a major problem for us and we still do not have a vital non-lethal tool like the BM or CHP laser dazzler!”*** Mr. Land had in the past repeatedly made the case that he and JNLWD were not responsible for requesting that dazzler candidates be judged by the LSRB, but rather that it was a Service responsibility. Yet, it was Mr. Land who was the “Responsible Authority” for the 1st

Dahlgren report, and NSWCDD was the lab designated by the LSRB as being responsible for conducting technical testing for the Naval Services.

Mr. Land's efforts to distance himself and the JNLWD from any CHPLD LSRB scheduling responsibilities was odd, as was his effort to deny any responsibility for getting the 1st Dahlgren report to the vendor for corrections. This was particularly so in light of Mr. Land's involvement in advising and thereby expediting GBD-IIIC approval as a USMC sole source choice, and his past derogatory comments regarding CHPLD. It is also noteworthy that Mr. Land played a central role in the dispatching by JNLWD of Maj Beate to Iraq with the purpose of selling the GBD-IIIC attributes to the I MEF (Fwd) staff. It is said that Beate's hard sell tactics were unwelcome at I MEF (Fwd) HQ. In fact it was reported that Beate was eventually asked to leave by the Acting CoS of I MEF (Fwd) for his circumvention of his I MEF (Fwd) staff hosts. In the end, Mr. Land appears as a central figure in the inability of the corrected CHPLD from being seen by the LSRB in accordance with LtGen Amos' guidance. It was these GBD-IIIC-supportive/CHPLD-dismissive activities of JNLWD and the combat developers that led I MEF (Fwd) staff to conclude that competition-stifling practices were at work. I MEF (Fwd) believed that these might be the reasons that the original II MEF (Fwd) UUNS request for CHPLDs and I MEF's continued insistence on CHPLDs was being delayed and ultimately rejected.

In an e-mail on 4 Dec 06 the I MEF (Fwd) G-9 followed up by sharing his concerns with the Director of the JNLWD, Col Kirk Hymes. Excerpts of his e-mail (Ref. e.2.) include: ***"...the GDB III Laser Dazzler [was submitted] to the LSRB with the specific intent of using it to provide a material solution to the II-MEF Laser Dazzler UUNS...The GDB III appears to have been expedited through the LSRB...at the expense of the CHP...causing a perspective by some of non-competitive practices...In the end we get anything but an expedited process, with a need signed on 9 June 05 and nothing delivered to date to either MEF, and a process that might not withstand deeper scrutiny...The CHP was [later] sent to Dahlgren... to receive a technical evaluation [by] NSW DD, when their laser folks had a dog in the fight, namely their own competitive laser configuration, possibly one connected to the GDB III makers...[this] has raised our doubts..."*** This was the second time that questions regarding the credibility of the Dahlgren testing had been raised by GCE advocates or operators, the first originating in PP&O in Aug 06.

On 11 Dec 06 Col Steve Ralph, the Deputy G3 and AT/FP Officer for I MEF (Fwd), wrote an e-mail to Maj Greg Roper of MCSC. Col Ralph, was responding to the GBD-IIIC distribution plan that Roper had formulated, along with Mr. Grundy at MCCDC, and submitted to I MEF (Fwd), G3. Col Ralph's e-mail (Ref. e.2.) stated in-part: ***"The only issue I have is that you gave me a run down on the GBD-IIIC which is not the Laser Dazzler we asked for. Where in the process is the CHP Laser Dazzler that we originally requested? And if it was side tracked who side tracked it and/or replaced the requested dazzler with the GBD-IIIC. Not trying to throw stones but, understand why it was replaced and the reasons and how we can speed up the process; given the original request was submitted over two years ago."***

In a separate e-mail to JNLWD, on 19 Dec 06 the President of LE Systems (Mr. Titus Casazza) wrote an e-mail to Mr. Land. LE Systems had provided a CHPLD test article to the JNLWD in the Jul-Aug 06 timeframe for the purpose of renewed technical testing in

preparation for presentation to the LSRB. Mr. Casazza stated (Ref. e.2.) in part: ***“I have been Informed that disparaging and possible slanderous comments have been made by individuals with regard to the L E Systems CHP and these comments were based on a report done in early August 2006 I have also been Informed the report was disseminated to others by you with editorial comments. I demand you provide me with the report and any copies of editorial comments that you may have made when disseminating the report to others. Please explain why any concerns that had arisen from the report were not passed on to L E Systems at the time or shortly thereafter. Please also explain why our product was given to a Navy entity for evaluation that is a direct competitor to LE Systems and not to the USAF Lab (certainly a more independent evaluator) where other devices including the CHP purchased by ATC were first evaluated. I have also been informed that the CHPs sent to I MEF are now prohibited from being used based on the report.”*** Blind copy recipients of this e-mail included I MEF (Fwd).

In a reinforcing e-mail on 19 Dec 06, the I MEF (Fwd) Science Advisor shared his concerns with the Director of the JNLWD as well (Ref. e.2.). The Director had attempted to place the blame for his JNLWD office’s dilemma on the CHPLD manufacturer for not correcting labeling discrepancies and other minutia. The Science Advisor stated in part: ***“... the Dahlgren report was never provided to LE Systems by JNLWD, the customer of the report...It might have helped the current situation if the report had been provided to LE Systems for corrective action.”***

The Director of JNLWD, Col Hymes, responded (Ref. e.2.) in part with: ***“I have directed Carlton Land not to contact LE Systems nor respond to any dazzler correspondence without my approval. Today's email from Mr. Casazza is being reviewed by counsel to determine what action is or is not appropriate. This is going to elevate the dazzler issue to the General Officer level again because of the potential of litigation and the potential impact on MARCORSYSCOM, MCWL, and MCCDC.”***

The I MEF (Fwd) Science Advisor responded to Director, JNLWD in an effort to get his focus off of protecting his program from perhaps well-justified criticism and litigation. I MEF (Fwd) responded in an e-mail (Ref. e.2.) that said in part: ***“Whatever personal legal issues JNLWD, MCCDC and SYSCOM might be thinking about, I believe they should also be thinking about quickly getting these devices here in theater approved for use by I MEF...Since last RIPTOA [deleted] innocents have unnecessarily been killed and approximately [deleted] injured in EOF incidents that could have been mitigated with dazzlers generally and with the requested CHP specifically. Similar numbers can be presumed for our II MEF predecessors. Instead of shutting off communication with LE Systems you should get their device in front of the LSRB immediately...In conclusion, the CHP issues were arguably never safety...Safety was used as a wash to conceal other priorities. They were...issues of government programmatic interests and possible non-competitive practices, and the MEFs and their missions have suffered as a direct result...I would ask you to please contact the vendor and then get the CHP before the LSRB. That would appear to be the right thing to do.”*** Unfortunately, Col Hymes took an opposite tact.

Upon hearing that CG, I MEF (Fwd) had open purchased 28 CHPLDs, Col Hymes, based on the advice of his SME Mr. Land, set in motion a process that would lead to a prohibition of the Dazzler's use in MNF-W. He justified his decision to recommend to DC, PP&O and further to CG, I MEF to stand down the deployment of the CHPLD dazzlers on safety grounds. He was clearly operating in good faith. Like LtGen Amos before him, Col Hymes made his decision after weighing all of the information that had been provided to him from his SMEs. He, like the General officers at MCCDC, MCSC, MCWL, and HQMC trusted that the information regarding the two candidate systems provided to them was technically accurate and unbiased. Over time it would become apparent that he had been misled by both less than fully competent technical advice from below and the alternative programmatic priorities of his employees.

Col Hymes was also new to the JNLWD at that time and was not aware of all of the dazzler related activities, discussions, and communications that had preceded his assumption of Director duties. He was absolutely dependent on his SMEs for insight. However, the technical information that was passed to him by the NSWCDD report, Mr. Land, and MCCDC NLW SMEs regarding the superior safety of the GBD-IIIC was false, and I MEF (Fwd) was well aware that it was false.

In the end, CG, I MEF (Fwd) followed CG, I MEF instructions to collect up and secure every CHPLD that was delivered to theater and until such time of their LSRB approval or further direction to have them shipped back. Soon thereafter, the CHPLDs were directed to be shipped back to MCSC who had by then assumed responsibility for the LE Systems contract.

c. The I MEF (Fwd) CHPLD-related UUNs of Dec 06

(1) Small Unmanned Combat Air Vehicle (SUCAV)

On 1 Dec 06 the DCG, I MEF (Fwd) (BGen Neller) signed an UUNS asking for a Small Unmanned Combat Air Vehicle (SUCAV) (Ref. r.18.). The SUCAV was a weaponized COTS Tier II UAV that included a suite of ISR, non-lethal, and lethal capabilities for employment by tactical forces at the lowest practical echelon. One of the non-lethal components of SUCAV was the CHPLD capability: ***“The SUCAV must also mount two LE Systems green Compact High Power (CHP)TM illuminator-dazzlers having a rated output of approximately 2 Watts average power and 4 Watts peak power, each. The systems must be internally integrated, with each one parallel to the longitudinal axis of the aircraft, one on each side, with apertures conforming aerodynamically to the leading edge of each wing. These devices can be employed for various purposes including but not limited to visible, coherent target illumination at night, and day time target dazzle to frustrate small arms engagement of the SUCAV during ingress and attack. Again, activation of the lasers must be a remote control option for the operator pilot.”*** Neither the SUCAV nor the higher power CHPLD components of the UUNS would be acted upon by MCCDC.

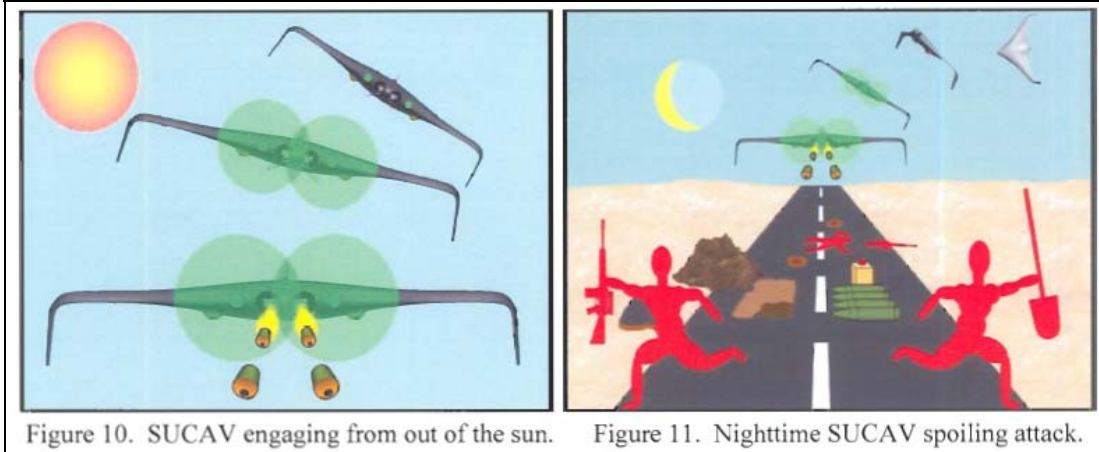


Figure 10. SUCAV engaging from out of the sun. Figure 11. Nighttime SUCAV spoiling attack.
 Figure 18. From Page 10 of the later CHPLD UUNS, images from SUCAV UUNS.

(2) Mobile Acoustic Sniper Detection and Neutralization System (MASDANS)

On 13 Dec 06 the DCG I MEF (Fwd) followed up with an UUNS seeking a Mobile Acoustic Sniper Detection and Neutralization System (MASDANS) (Ref. r.16.). MASDANS was a counter-sniper capability intended for a survivable MRAP platform, as an alternative to the HMMWV-based Counter Sniper vehicle (CSV) that ONR were proposing to the MEF. The MASDANS included a combined arms suite composed of a mix of networked detection and ISR, HMG lethal, and non-lethal capabilities. One of the NLW specifically requested was the Dazzler: *“The high power green dazzler of the MASDANS solution needs to be capable of producing a circular spot one meter in diameter at a range of 100 meters, and be continuously variable to allow operator balancing of spot size and power density at longer ranges...The high power green dazzler of the MASDANS solution needs to possess sufficient average power to produce credible glare continuously throughout the one-meter diameter spot...Furthermore, as a threshold, the MASDANS needs to project green laser dazzler energy sufficient to cause credible glare at midday against 95% of human targets engaged at any point around the entire perimeter of the one-meter spot, even after taking into account the uneven energy distribution that favors the center of the spot in practice...The high power green laser dazzler of the MASDANS solution needs to have an operator-activated option to integrate the dazzler with the IR laser range finder...”* As with the SUCAV UUNS, neither the MASDANS nor the CHPLD component of the MASDANS JUONS would be acted upon by MCCDC.

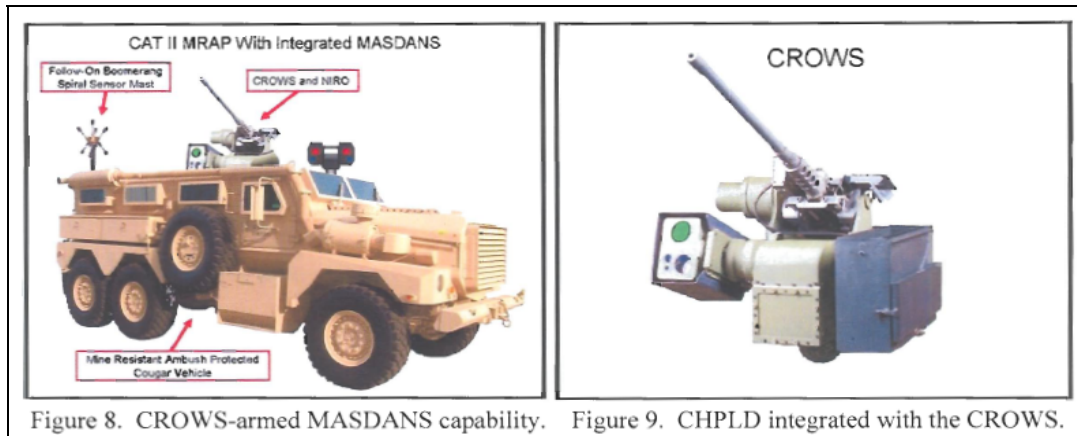


Figure 8. CROWS-armed MASDANS capability. Figure 9. CHPLD integrated with the CROWS.
 Figure 19. From Page 11 of the later CHPLD UUNS, images from MASDANS UUNS.

(d) The I MEF (Fwd) Compact High Power Laser Dissuasion (CHPLD) UUNS

On 29 Dec 06 the DCG I MEF (Fwd) signed an UUNS specifically requesting a Compact High Power Laser Dissuasion (CHPLD) capability (Ref. r.15.). This UUNS was transmitted simultaneously to MCCDC and MARCENT. Shortly after its receipt it was formally endorsed by MARCENT and submitted to Quantico for fulfillment.

(1) CHPLD UUNS submission on 1 Dec 06

Like the II MEF (Fwd) UUNS that had preceded it, the CHPLD UUNS specifically sought the unique COTS capability offered by the LE Systems CHPLD. The UUNS stated in part:

“I MEF (Forward) has an urgent need for a ...CHPLD capability. ...the CHPLD needs to provide Marines manning...ECPs, engaged in tactical movement, and providing perimeter security a standoff dissuasion capability at target ranges of as little as 70 meters to beyond 300 meters...This will safeguard the lives of innocent civilians who get too close to Marine positions and exclusion zones, while interrogating the intent of more determined adversaries to justify kinetic actions taken against them...The submission of this UUNS has three purposes. 1) The first purpose is to revalidate the original II MEF (Fwd) OIF 04-06 UUNS for a Laser Dazzler capability dated 9 June 2005... 2) The second purpose of this UUNS is to define I MEF-specific needed capabilities as the result of operational experience in ...MNF-W...AOR. This will include defining the threshold requirements for the integration of CHPLD capabilities with a) individual Marines and their T/O weapons, b) anti-sniper tactical vehicles, and c) combat unmanned aerial vehicles (UAVs)... 3) The third purpose of this UUNS is to recommend a future expansion of the laser dazzler-enable dissuasion requirement with a view to employing more operationally realistic safety criteria and more demanding physical construction standards based on actual military requirements and emerging threats.”

“Laser light poses greater hazards to eyes due to the properties of phase coherence and parallel path collimation. When light from a conventional, incoherent light source enters the eye, even after focusing, it forms an extended image across the retina

allowing significant power to be dissipated. However, when the coherent and collimated laser energy of a laser enters the eye it is focused onto a small spot on the retina having higher energy density, even from a lower powered light source. This is the strength of the dazzler, i.e. the capability to project non-lethal dissuasive effects from a compact light source from great standoff. It is also the weakness of the laser, as the concentrated parallel propagation of in-phase light energy of a single wavelength risks injury at closer range and ultimately limits the utility of any high power, single point source-based laser dazzler to longer range.”

“An aperture that combines many parallel point sources can preserve the properties of laser beam collimation for the combined beam while reducing the risk of eye damage at closer range due to the lateral distribution of the point sources. Individual beams thereby propagate independently and out of phase, and consequently having their own divergence characteristics. At the target the beams are superpositioned in space so as to again achieve a spot energy distribution that is Gaussian. But when passed through the pupil and focused onto the retina these superpositioned, out-of-phase beams will have some of the injury-mitigating properties of incoherent light. This includes extended image projection eliminating some of the risk of concentrating injurious, in-phase energy on a single point.”

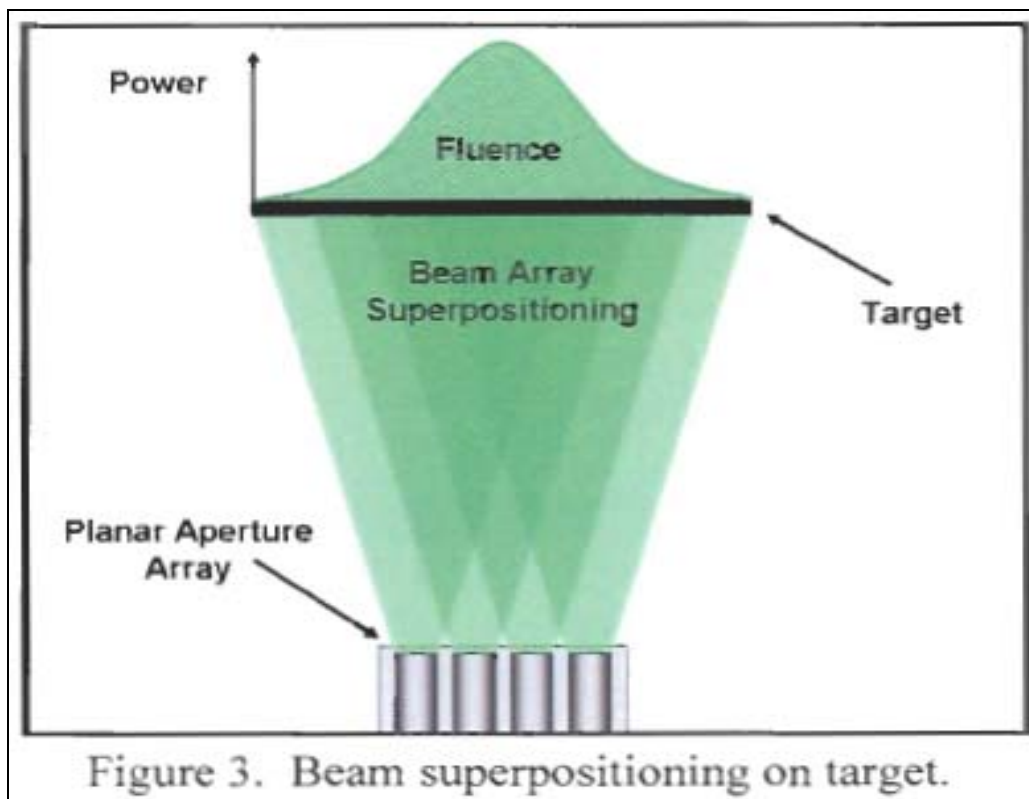


Figure 20.a. Beam superpositioning on Page 8 of the I MEF (Fwd) CHPLD UUNS.

Another observation that the I MEF (Fwd) CHPLD UUNS was intended to communicate to the combat developers was the GCE’s interest in revisiting the ANZI standard for military dazzlers. The power density parameters determining the ANZI guidelines have highly restrictive for the purpose of reevaluating dazzler NLWs. The only way of bringing this to

the attention of the LSRB and others was presumably via an UUNS document submitted via MCCDC:

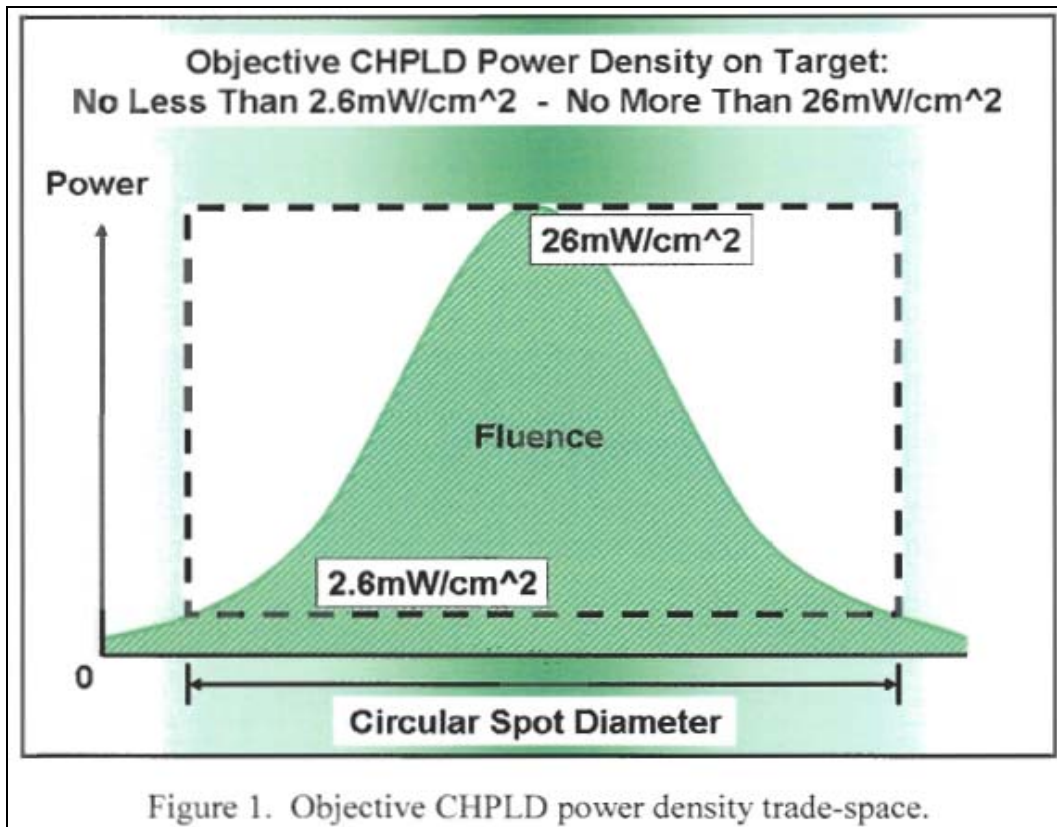


Figure 20.b. Relevant power density thresholds on Page 6 of I MEF (Fwd) UUNS.

(2) MARCENT intervention on behalf of I MEF (Fwd)

In spite of the efforts of I MEF (Fwd) to encourage the combat developers to see the real need for the CHPLD, the fielding of the GBD-IIIIC was in full swing, as were preparations to return the CHPLDs to the U.S. On 18 Jan 07 LtCol Thaddeus Jankowski, the Branch head for Policy, Plans, and requirements within the Tampa, FL HQ of MARCENT wrote (Ref. e.2.) an e-mail to Mr. Blasiol at MCCDC. Mr. Blasiol had and maintains a central hand in the material solution selection and fielding decisions relating to the fulfillment of UUNSS received at MCCDC. Mr. Blasiol also oversees the Force Protection Integration Branch within the CDD run by Col Oltman. Col Oltman's deputy was Mr. Grundy, the NLW SME at MCCDC and dazzler requirements AO. Other addressees on LtCol Jankowski's e-mail included members of MCSC, II MEF, I MEF, and I MEF (Fwd) staffs. The e-mail well-captured the incomprehensibility of the MCCDC LSRB delays, GBD III sole source decision, and the apparent overall mismanagement of the II MEF (Fwd) and I MEF (Fwd) requests for the COTS CHPLD. The e-mail to Mr. Blasiol, with a carbon copy to Col Oltman, both responsible for overseeing Mr. Grundy's dazzler and NLW activities at MCCDC, stated:

“I did some research this morning, and I’m confused. II MEF (FWD) asked for this in July 2005!! (CDTS #05209UB). And MCCDC is only now approving a sole-source (???)...for a different system.

1. In that II MEF UUNS #05209UB, they specifically ask for the CHP. Now, this year, I MEF not only concurs with that request, in fact Gen Zilmer and his staff are evidently standing firm on the technical superiority of the original II MED recommendation. So we have both MEFs in agreement on a recommended solution that is not even considered due to the Sole Source.

2. I’ve seen independent reports and other data that seems reasonable that the CHP is a superior capability. Yet 18 months later, you are sole-sourcing to someone else? I guess I would have thought that the CHP would have been submitted to the LSRB along with this other system you are fielding, and if you take 18 months to approve the requirement, you would have chosen to compete it...or sole-source the better (CHP) system.

3. Why are we only now delivering a capability, almost two years after the UUNS from II MEF was submitted...for a COTS item?

4. LSRB is the most often cited reason for this delay...but why do we permit a bunch of people on a board in America to meet only every six months, when a capability useful in-theater goes unfulfilled? I bet if we asked them to meet on-order, they would. Even Congress is willing to spend \$1.5B on MRAPs, so I think LSRB can be led to respond more quickly.

5. In a Joint world one standard is supposed to apply whenever possible. We know very substantial capability differences exist between Angel Fire and constant Hawk, so we as for Angel Fire and get it. We know very substantial capability differences exists between C-RAM and G-BOSS (two cameras v. 1, networking for immediate forensics, yet with no less capability at the FOB than C-RAM provides), so we are in the process of making sure what we acquire truly meets the COMUSMARCENT-approved G-BOSS requirement (including networking). Yet in this case, CHP dazzlers are being used for the exact same reason elsewhere in theater, so why isn’t the Army’s or SOCOM’s approval of CHP good enough for USMC?

6. I’ve asked I MEF (FWD) for some risk analysis that estimates the probable decrease in escalation events and associated Iraqi casualties. This risk analysis centers on the question: if we had sole-sourced in Oct 2005 and delivered by Jan 2006, how many innocent IZ would not have been needlessly killed or injured? Just like the C-RAM engineer’s recommendation to stop the presses on the ITS towers was an example of one-sided risk analysis (sure, the generator might hit a bump, rip away from the frame flop over and kill a Marine, but what is the comparative likelihood of that system getting safely emplaced & saving 10 Marines from an IED...etc), perhaps here we might have benefited from risk analysis associated with an 18 month path to fielding the dazzlers, too.”

(3) 2nd NSWCDD Laser Safety Program (G73) test of the CHPLD

The pressure that MARCENT exerted on the combat developers at Quantico was particularly helpful in accelerating the pace of CHPLD reconsideration. During Feb 07 the LSRB directed that NSWCCD again evaluate the CHPLD (Ref. t.6.) in preparation to bring the device before the LSRB, which the CHPLD had been excluded from by JNLWD before. This sequence was requested by MCCDC and MCSC leadership due to the continued interest of I MEF (Fwd) operators in the CHPLD, as evidenced in the submission of the recent UUNS and by I MEF (Fwd)'s open purchase of 28 CHPLDs and MARCENT's intervention.

The dual-hatted, Mr. Sheldon Zimmerman of Code G73 who also served as an LSRB member, and his team were again employed (by the LSRB) as the lead investigator for the second Dahlgren evaluation of the CHPLD. In spite of Mr. Zimmerman's caveat in the original CHPLD report, namely: ***"Note that the laser safety parameters presented in this report...were found using simplified methods. A more detailed analysis would be required before the systems could be evaluated for deployment,"*** he employed some of that ***"simplified"*** data for the second report. This is evidenced in the report comment that: ***"A previous version of this system was evaluated in August and changes have been made. For completeness, some data from the previous evaluation are included herein."*** In choosing to use some of the erroneous simplified data, conclusions and recommendations of the second evaluation were doomed to repeat some errors of the first, with respect to the critical NOHD figures. A review of the second report reveals that Mr. Zimmerman again also used the point source simplification to calculate the predicted NOHD of the four source CHPLD system.

The employment of Dahlgren generally, and Mr. Zimmerman specifically by the LSRB to lead the second evaluation of the CHPLD (Ref. t.6.), after questions on the independence of Dahlgren's testing had been repeatedly raised, is curious. It is cause for even greater concern that Mr. Zimmerman also was, according to the JNLWD, allowed to serve as a member of the LSRB. Dr. Zimmerman was probably aware that the suspect figures of his ***"simplified"*** (erroneous) treatment of the CHPLD in the first evaluation had generated significant discontent in I MEF (Fwd), caused fielding delays, and led to unfortunate operational consequences. As a member of the LSRB he was in a position to judge the veracity of his first evaluation, and in this he had a concurrent incentive to pass favorable judgments on that testing. He also had the authority to propose and defend Dahlgren as the lab testers choice of the LSRB for the second evaluation, one he would again lead and later judge at the LSRB. Mr. Zimmerman would appear to have a significant conflict of interest on the CHPLD issue, and there is no evidence that he asked to be recused. Similarly, all the while the JNLWD and MCCDC dazzler SMEs chose not to intervene or seek independent outside expertise such as from AFRL or Army labs, in spite of their full awareness of the potential conflict of interest.

The second Dahlgren report again recommended against approving the CHPLD for operational employment due to expressed safety concerns. However, the second report cast an even more critical eye on the CHPLD, imposing on the system requirements, acceptance criteria, and subjective metrics that went far beyond those applied to GBD-IIIC in that device's fast track LSRB approval process.

The report began with a listing of what the NSWCDD investigators believed to constitute areas where the CHPLD continued to fail to conform to OPNAVINST 5100.27A/MCO 5104.1B. However, a further reading of the report reveals that the alleged gravity of the CHPLD shortcomings implied by the listed discrepancies is exaggerated. Later in the report the details and qualifications of this list are articulated under the Laser Design Requirement Checklist, showing that the CHPLD could still be employed safely and effectively:

- The laser is not yet military exempt (Item 2)
- The laser is not designed to preclude unintentional laser output with the click-switch rear cap because the laser can be left on when the batteries are changed and begins lasing as soon as the cap is replaced (Item 4)
- Secondary beams are present (Item 5)
- Beams are focused together at about 3 m (Item 6)
- Output pulses are irregular (Item 8)
- No armed/firing indicators, depending on the rear cap used (Items 11 and 33)
- Warning label information incorrect (Item 23)
- No camouflage labeling used (Item 23f)
- Single operator error results in emission with click-switch rear cap (Item 24)
- Single operator action results in emission, depending on which rear cap is installed (Item 25)
- No dead-man switch or watchdog timer if the click-switch rear cap is used (Item 29)
- Cover will now withstand repeated firings, but care should be used to avoid peripheral damage as seen in the front view in figure 2-1 (Item 30b)
- No means to differentiate between armed and firing, depending on rear cap used (Item 34)
- Item not LSRB approved (Item 42)

Figure 21. Like its first evaluation of the CHPLD, NSWCDD again misrepresented the gravity of OPNAVINST 5100.27A/MCO 5104.1B shortcomings in this listing on Page 6 of the report.

Upon closer inspection of the Laser Design Requirement Checklist attached to the report, and the details of the conclusions and recommendations paragraph, it becomes clear that the report was specifically intended to cast a shadow of concern over the CHPLD. This also becomes clear in the MCSC-recitation of the 16 Feb 07 LSRB proceedings that followed, as well as the comments within the LSRB Chairman's letter that followed on 22 Feb 07. Report comments include:

Administrative minutia employed against the CHPLD included: 1) no FDA military exemption (applied for by vendor), 2) warning label information (vendor based label on MPE range, 3) the meaningful range for the operator), 4) no use of camouflage labeling (not required, or requested by operator). Technical minutia employed against the CHPLD included: 1) Secondary beams are present (determined not to pose hazards in both 1st and 2nd NSWCDD evaluations), 2) output pulses are irregular in form (operationally meaningless), 3) beams are focused together at about 3 m (operationally meaningless, as actual NOHDs are all well beyond 20 meters), 4) multiple rejections related to OPTIONAL click switch rear cap (lanyard switch, also included, resolved all issues favorably); and 5) item not LSRB approved (i.e. the self-evident fact that the CHPLD was not brought before the LSRB concurrently with the GBD-IIIC in 06).

The three areas of greatest need for the I MEF (Fwd) operators higher total device power, larger diameter spot size on target, and a shorter NOHD. The measurements and calculations of the NSWCCD in these areas was summarized in two charts within the report. The first compared the certain values measured or calculated for the test articles provided during the 1st and 2nd evals. The parameters listed were wavelength, beam size, beam divergence, output power, PRF, and pulse duration:

	Previous System	New System
Wavelength	532 nm/1064 nm	532 nm/1064 nm
Beam Size	Each beam is 1.0 mm in diameter	Each beam is 0.5 mm in diameter
Beam Divergence	3.7 mrad (effective)	3.5 mrad (effective)
Output Energy	168 mW per beam	155 mW per beam
Pulse Repetition Frequency	16 Hz	35 Hz
Pulse Duration	28 ms	28 ms

Figure 22. NSWCCD CHPLD divergence and other parameters presented to the LSRB.

As noted in observations concerning the 1st NSWCCD report, the second report again identifies a beam divergence angle that is completely uncharacteristic for the diodes that are produced in mass for the CHPLD product line. Any calculations based on this incorrect (and apparently subjectively determined) angle would directly impact NOHD figures. Another issue of concern with the table relates to the treatment of the CHPLD as a pulse laser. In fact it is a “gated laser” with a pulse train that has been measured independently by Laser Compliance as having a duty cycle of 70% and only a slight variation between peak (633 mW) and average (443 mW) power. Yet, NSWCCD felt compelled to penalize the system on both the 1st and 2nd evaluations with a pulse laser characterization, with direct impacts on NOHD. It is noteworthy that the GBD-IIIC had been treated as a CW laser even though it possesses an optional pulse mode. As noted throughout the study, this favored and expedited treatment of the GBD-IIIC at the expense of the operator-requested CHPLD raises doubts with the LSRB, NSWCC, and Quantico institutions with regards to objectivity. The second table compared the values measured or calculated for the test articles provided during the 1st and 2nd evals concerning the CHPLD class, NOHDs, and ODs:

	Previous System	New System	New System 10-s exposure
ANSI Classification	4	4	4
IEC Classification	4	4	4
NOHD (unaided)	65.9 m	77.0 m	121 m
NOHD (5-cm aided)	447 m	521 m	823 m
NOHD (8-cm aided)	717 m	836 m	1.32 km
NOHD (12-cm aided)	1.25 km	1.46 km	2.30 km
NSHD	1.9 m	2.8 m	2.8 m
OD (unaided)	2.5	3.2	3.6
OD (aided)	3.1	3.2	3.6
OD (max)	3.1	3.2	3.6

Figure 23. NSWCDD CHPLD class, NOHDs, and ODs presented to the LSRB.

(4) Presentation of the CHPLD to the LSRB on 16 Feb 07

Presented with the 2nd NSWCDD report, on 16 Feb 07 the LSRB met to discuss the CHPLD, ending in its unanimous rejection by board members. In a letter dated 22 Feb 07 (Ref. t.7.) the Chairman of the LSRB formalized the LSRB’s rejection of the CHPLD, stating in part: ***“Based on the information presented to the board, the LSRB concluded that the CHPLD is more hazardous than the GBD-IIIC, has more associated safety issues and still does not provide the capability to accurately determine the distance to the target prior to firing the laser. Therefore, the LSRB cannot provide a safety approval for the CHPLD. The LSRB does recommend that MARCORSSYSCOM continue to look for a more suitable laser that meets the mission need and protects against inadvertent lasing.”*** In his rejection letter the Chairman referenced the 25 Jan 07 2nd NSWCDD evaluation of the CHPLD. In rejecting the CHPLD, the Chairman of the LSRB committed the Department of the Navy’s senior expert panel on laser safety to several technical, operational, and professional errors:

(a) Technical Errors

1) the imposition of a new standard for the CHPLD that had not been required of GBD-IIIC before LSRB approval and fielding, namely an engineering solution for determining the distance to target; 2) the flawed treatment of the CHPLD as a point source leading to incorrect 77 meter (1/4 second) and 121 meter (10 second) NOHDs for the CHPLD; 3) the continued insistence that the ***“CHPLD is more hazardous than the GBD-IIIC,”*** when in fact the GBD-IIIC was and is measured to be the more hazardous device; 4) the erroneous treatment of the CHPLD as an ANZI and IEC Class IV laser instead of the Class IIIB that it is; 5) the questionable NSWCDD G73 penalization of the CHPLD with a small beam divergence angle by investigators who employed a subjective ***“worst case”*** standard at their own discretion; 6) the suggestion that the CHPLD was significantly out of compliance with OPNAVINST 5100.27A/MCO 5104.1B, when in fact it wasn’t; and 7) the Chairman’s endorsement of NSWCDD’s recycled ***“simplified”*** calculations from the first NSWCDD G73 evaluation of Aug 06 for inclusion and use in conclusions and recommendations in the second CHPLD evaluation.

(b) Operational Errors

1) NSWCCD's imposition of a requirement that operating forces assign NOHDs and ODs to dazzlers based on an operationally irrelevant ten-second exposure, thereby restricting the employment of all dazzlers; 2) the unqualified statement regarding safety issues related to the storage and disposal of lithium batteries when those batteries had been approved by the NSW Carderock Division in a letter titled "*Safety Evaluation of Lithium Battery Used In Laser Dazzler,*" dated 29 Dec 05; 3) the continued LSRB insistence on applying the conservative civil-based ANZI MPE standards for the purpose of determining NOHD for dazzlers that are to be employed as NLW alternatives to deadly force; 4) the questioning by the LSRB of the MEF requirement for more dazzlers beyond the 400 that had previously been approved; 5) the questioning by the LSRB of why the operating forces were requesting to have a different laser approved, rather than the one that the NSWCCD and LSRB had already decided upon; 6) the unqualified NSWCCD recommendation that camouflage labels be employed; and 7) the operationally baseless recommendation that all personnel within the NOHD of dazzlers be required to wear eye protection;

(c) Professional Errors

1) the imposition of a new 10 second exposure and ranging standards on the CHPLD that had not been imposed on the GBD-IIIC; 2) the decision of the LSRB not to terminate approval for operational employment of the GBD-IIICs even after their deficiencies were revealed by new LSRB standards; 3) the decision of the LSRB not to consider the much improved I MEF (Fwd) UUNS for the CHPLD even though the JNLWD, NSWCCD, and LSRB were in possession of that UUNS well before the 22 Feb 07 Chairman's letter; 4) the appearance of the less than professional practice of the LSRB in defending GBD-IIIC decisions to retain credibility of the LSRB body rather than get at the facts; and 5) the appearance of impropriety by the LSRB in defending erroneous product evaluation results with the consequence, and perhaps the purpose of stifling free and open competition.

The errors which the LSRB Chairman and the board's members endorsed demonstrated either a lack of expertise, a desire to endorse and protect the validity of past LSRB and NSWCCD G73 decisions, or a combination of both. The technical errors were not insignificant as evidenced in Laser Compliance's later independent test results. Also, the operational errors show that the LSRB was prepared to venture outside of its area of expertise and pass unqualified operational judgments. The trend of conduct by the LSRB and its lead lab NSWCCD G73 indicates efforts to exclude the CHPLD from consideration perhaps because it threatened the GBD-IIIC. Finally, the LSRB members have demonstrated their lack of ability to balance the military risks of exceeding civil standard MPEs against the urgency of operating forces for the benefit of avoiding kinetic engagements in EOF.

On 16 Feb 07, Mr. Grundy sent an e-mail in which he broadcast the outcome of the meeting of the LSRB which had occurred the day prior. His report to his MCCDC superiors (Col Oltman and Mr. Blasiol) occurred just after he met with SYSCOM earlier in the day where he as the MCCDC rep was given a heads up on the LSRB proceedings. In his e-mail (Ref. e.2.) Mr. Grundy stated: "*Gentlemen,; The NL Branch, FPID received a back brief this morning*

from MCSC, PG-13 on the LSRB review of the CHPLD. It was the unanimous recommendation of the LSRB board members not to approve the CHPLD for use. It has multiple problems. The particulars of the LSRB decision will be forthcoming in the next few weeks. In the meantime, MCSC is compiling an AA report with detailed information.” While PG 13 had requested that MCCDC not broadcast the outcome, Mr. Grundy decided to do so anyways. The e-mail proliferated quickly, up and outside of the MCCDC chain, including back to MCSC.

In response to Mr. Grundy’s premature release of the LSRB’s decision, Mr. Robert A. Forrester of PG 13 immediately wrote (Ref. e.2.) an e-mail to BGen Brogan to qualify the LSRB’s decision and to minimize misinformation begun by the MCCDC e-mail:

“Here are the facts with the attached information paper and laser hazard evaluation brief to provide amplifying information:

The LSRB met yesterday. Information presented was the laser hazard evaluation from NSWCDD Code G73 [Mr. Sheldon Zimmerman’s Division], a Concept of Employment brief (updated COE received from MCCDC today) and a training plan brief. Reception from the LSRB members was less than enthusiastic.

1) Already fulfilled the requirement of the [II MEF Fwd] UUNS with the GBD III, why are you coming back to us? Where’s the requirement? Although we [SYSCOM – PG 13] stated at the beginning of the session our purpose was to seek LSRB approval for a system procured by the operating forces with their own O&M funds and being held from use until the LSRB approved.

2) Why aren’t Marines wearing laser eye protection when using green beam lasers? (may become a larger issue than just dazzlers)

3) If the LSRB approved the CHP they would retract their approval of the GBD III. The approval for the GBD III expires in March 2008. The LSRB is pushing for engineering vice procedural controls; something we don’t have for either of these systems...

4) Technical barriers to LSRB approval are few:

- Get rid of the click on the rear cap and replace with arming lanyard cap (already provided)

- Needs military exemption (manufacturer claims he’s already requested from the FDA)

- Warning label needs to reflect correct NOHD (77 meters on the unit tested). This distance varies because of power output variations between individual laser modules.

- Needs to establish nomenclature and model numbers to differentiate between the varying configurations of his products.

- A member of the LSRB recommended that consideration be given to establishing NOHDs and ODs based on a 10 second exposure (vice ¼ sec) given the intended use of the system which is targeting human eyes. This in effect would push the NOHD out close to the credible glare limits of the system and impact its intended employment. Initial consensus of the LSRB members was unfavorable.

We think that the formal letter, which documents the LSRB's recommendation will cite both the technical shortcomings of the system and the requirement for additional laser dazzlers beyond the 400 GBD III systems on contract. As discussed earlier, the technical fixes are easily addressed. I think the LSRB is outside of its box questioning the requirement.

All PG 13 attendees at the LSRB were requested not to broadcast the board's recommendation until formal release of the LSRB Chairman's letter. We met to discuss the results this morning and asked the MCCDC attendee to wait for our information paper to be staffed before this information got out." (underline emphases are those of the author)

Even though Mr. Grundy apparently felt compelled to publish the results immediately, it is clear from Mr. Forrester's e-mail report was far less deferent to the LSRB regarding the negative outcome, than Mr. Grundy's purposeful e-mail. It is noteworthy that Mr. Forrester was present at the LSRB meeting and Mr. Grundy was not. It is also interesting that Mr. Grundy felt compelled to ignore PG 13's request to wait for SYSCOM to release the results in a formal information paper. The pattern of Mr. Grundy receiving and publishing information unfavorable to the CHPLD early is consistent with the GBD-IIIC-protective/CHPLD-dismissive biases that MCCDC, JNLWD, and at least one SYSCOM project officer had evidently shown since the summer of 2005. Yet, an unquestioning faith in the LSRB results was not shared by others, including DC, DCI and the Commander, MARCENT.

The MCCDC and I MEF leadership were openly skeptical of the LSRB's motives and decision. In response to Forrester's e-mail, on 18 Feb 07 LtGen Amos wrote (Ref. e.2.) an e-mail to BGens Alles (MCWL) and Brogan (MCSC), with carbon copies to LtGen Mattis (MARCENT), LtGen Stalder (II MEF) and MajGen Gaskin (II MEF Fwd). Excerpts included: *"...I don't need the LSRB questioning the requirement coming from the warfighter...that's not their purview. If the CHP dazzler works better than the [BE] one then that's the one we want....this already has press and congressional interest (rightfully so) and the board may find itself professionally embarrassed and trying to publicly defend its position."*

In an e-mail response to LtGen Amos on 18 Feb 07, LtGen Mattis wrote (Ref. e.2.) in part: *"Only the fact that you... are engaged in this fight on our behalf keeps me from climbing on an airplane and hunting down these rear-echelon [expletive] who would question the requirement out of theater...The last thing we need are some smug, safe, stay-at-home [expletive] questioning the need to avert tragic EOF engagements because they've chosen to dismiss the requests from our lads in the fight...the claptrap reported...in Mr. Forrester's e-mail is not compelling since the technical decision appears to be personalized and bordering*

on irresponsible....We have Marines in difficult positions and need to work together to help them resolve EOF without killing folks...due to a less capable laser that they wish to replace with a more capable version.” Even the strong expressions of concern with the LSRB report from DC, CDI and CG, I MEF were insufficient to stimulate an outside, independent revisitation of the board’s decision or a second look at the quality of the data used.

In the end, the CHPLD that the LSRB finally reviewed a year after the GBD-IIIC pointer had been expedited through approval was rejected. The LSRB rejection was based on flawed NSWCCD G73 testing of the CHPLD, with the flaws of the first evaluation having already been used to justify MCCDC’s and MCSC’s sole source of the GBD-IIIC in 2006. Even though this combat development process gave the appearance of being corrupted to outsiders, as noted by I MEF (Fwd) staff, it nevertheless led directly to the mass purchase and fielding of a significantly less safe and less capable dazzler device. It would only be later independent testing would soon reveal that the first CHPLD report of Aug 06 and its successor report of Feb 07 lacked technical competence.

(5) Independent testing of the CHPLD by Laser Compliance

LE Systems made repeated appeals to Marine Corps’ leadership to have the CHPLD reconsidered for operational employment. These included a letter to the CG, I MEF (Fwd) after the CG, I MEF had ordered the CHPLDs to be collected up and secured in theater. This was followed with a letter to CMC when promised interactions with the combat developers at Quantico and NSWCCD to fund LSRB-mandated corrections to the CHPLD did not materialize. With the exception of a letter from LtGen Amos (speaking for USMC) stating his satisfaction with the dazzler selection and fielding process to date, all recent LE Systems communications with the Marine Corps appear to have gone unanswered.

LE Systems remained confident in the safety and utility of its CHPLD product. After all, nine (9) units had been procured by Army Special Operations (ARSOC) in 2006, and were being employed by ARCOG operators in Iraq to great user satisfaction. Additionally, U.S. Navy SEALs had also procured one, though the LSRB rejection of the CHPLD prevented purchasing more or their operational employment, as the LSRB has bureaucratic cognizance over all Naval entities. Furthermore, the technical shortcomings of the Naval reports and decision making of USMC SME personnel was compellingly obvious, as was the possibility of conflict of interest. Finally, I MEF (Fwd) had desired the CHPLD all the way to RIPTOA and beyond, and also had little faith in the quality of the work of SMEs involved in the combat development process as it pertained to dazzlers. In frustration, LE Systems made an internal business case to have the CHPLD evaluated independently by laser experts outside of the DoD.

LE Systems approached Laser Compliance, Inc. of Bountiful, Utah. Laser Compliance is a widely respected tester of commercial laser products for the purpose of insuring adherence to industry, safety, and performance standards for public confidence. Laser Compliance and its President, Casey Stack, are highly regarded in the industry and LE Systems knew that their evaluation results of the CHPLD would be considered both competent and above reproach.

LE Systems desired Laser Compliance to evaluate the CHPLD's militarily relevant performance parameters, as AFRL and NSWCDD had already repeatedly done. The NOHD, MPE, power densities at various ranges, and laser classification were all necessary as they had been with DoD, though DoD had often been satisfied with mere calculation extrapolations. The major difference and testing improvement over the DoD's methodology that LE Systems sought from Laser Compliance, however, was that all data gathered was based on measurements of power densities, not just simplified calculations and extrapolations. This was the major weakness of both Dahlgren evaluations, and to a certain extent AFRL's as AFRL had also erroneously treated the CHPLD as a pulse laser. Casey Stack, the President of Laser Compliance, delivered his report to LE Systems (Ref. t.8.) on 27 Sep 07. The introduction of the report stated: ***"This document summarizes the results of laser performance testing requested by LE Systems. The device under test is described below. Tests and calculations are performed with regard to ANSI ZI 36.1 and IEC 60825-1. LE Systems provided quantity one of the 'Laser Dazzlers' manufactured by LE Systems for testing. This unit is serial number 00052. Unit was provided with a removable diffuser lens. Unit incorporates 4 pulsed 532nm, DPSS laser sources, arranged for near parallel emission. All lasers pulse synchronously. Lasers all appear to be roughly TEM00."***

In its testing Laser Compliance had measured a CHPLD NOHD of 29 meters based on the ¼ second blink response. The ¼ second blink response was also employed by NSWCDD as the standard in its original evaluations of the GBD-IIIC. It is noteworthy that a 72 meter NOHD based on the ¼ second blink response was validated at the LSRB as acceptable, at least for the GBD-IIIC, and led to that body's approval of the pointer-designator for operational employment as a NLW. The CHPLD had been held to a different standard of a ten second exposure, and failed. The GBD-IIIC was, however not recalled and remained fielded, in spite of the new standard.

Laser Compliance was also asked to measure the performance of the CHPLD based on the 10 second continuous exposure. While the 10 second exposure has no operationally-relevant basis, it was employed during the 2nd NSWCDD evaluation of the CHPLD to assign a much greater 121 meter NOHD. As a point source, the GBD-IIIC was also assigned a longer NOHD by the LSRB based on that standard, namely 114 meters based on the 10 second exposure. Based on the 10 second standard the CHPLD w NOHD as measured by Laser Compliance to be 45 meters, far safer than the NSWCDD G73-LSRB figure of 121 meters (Figures 24 and 25 below). Follow-up independent testing conducted by Laser Compliance in late 2007 measured the beam divergence of the CHPLD's individual lasers at a minimum of 8 mrad, another stark contrast with earlier NSWCDD results:

Parameter	Distance without Diffuser	Distance with Diffuser
NOHD 0.25 second exposure†	29 meters	5 meters
additional requested data		
NOHD for 1 second exposure*	35 meters	4.5 meters
NOHD for 5 second exposure*	41 meters	4.75 meters
NOHD for 10 second exposure*	45 meters	5 meters

† includes additional margin, but based on testing
 *calculated based on test results, also includes additional margin

Figure 24. CHPLD NOHD figures displayed in the Laser Compliance report.

Additional Requested Test Results		
Parameter	Value	Value
5mW/CM ² power location	14 meters without diffuser	2 meters with diffuser
Average power at 65 ft	3.1mW/CM ² without diffuser	119uW/CM ² with diffuser
Peak pulse power at 65 ft	4.43mW/CM ² without diffuser*	170uW/CM ² with diffuser*
Total maximum emitted power, (average power)	443mW	373mW, value after 30 seconds
Total maximum emitted power, (peak pulse power)	633mW*	533mW, value after 30 seconds*

*calculated

Figure 25. CHPLD power density figures displayed in the Laser Compliance report.

In the case of the GBD-IIIC it is reasonable to expect a much longer range hazard than the CHPLD, considering the device's single, powerful, collimated point source. It is also not surprising then that II MEF (Fwd) has now reported incidents of potential fratricidal eye injuries from using the GBD-IIIC in the Marine Corps Combat Lessons Learned (MCCLL) periodical (Ref. a.7.). One individual was apparently required evacuated out of theater for a thorough medical exam to determine if permanent retinal damage had resulted. The MCCLL also noted that GBD-IIIC injuries, transitory or not, have resulted in restrictions on the MCCDC-approved concept of GBD-IIIC employment, greatly reducing operator utility of the dazzler at closer ranges. Still, the CBD-IIIC remains fielded, and more are being purchased from BE Meyers, much of it presumably with approved Congressional earmarks. Similarly, and not surprisingly, the CHPLD with its much safer NOHD remains prohibited, even though MCSC maintains 28 of the safer devices secured in its Quantico facilities.

In summary, Laser Compliance confirmed that by the original ¼ second blink response standard, the prohibited CHPLD turns out to be significantly safer than the procured and fielded GBD-IIIC (29m versus 72m). Even by the operationally irrelevant 10 second exposure imposed by NSWCD G73 and now enforced by the LSRB, the CHPLD is again significantly safer than the GBD-IIIC (45m versus 117m). It is useful at this point to recap dazzler eye safety considerations for a clearer understanding of the technical differences between, and resulting operational advantages and disadvantages of the CHPLD versus the GBD-IIIC.

4. Discussion 2 - Dazzler safety, effectiveness, and production considerations

a. Dazzler safety and effectiveness considerations

The key safety parameter of candidate dazzler systems, pointers, and other operational lasers is known as the Nominal Ocular Hazard Distance (NOHD). It is important to note the permissions and prohibitions of GBD-IIIC and CHPLD are alleged in all USMC leadership and LSRB documents to be overwhelmingly based on safety considerations. The NOHD considerations and questions are therefore central to this case study.

The NOHD is the distance from the laser where the Maximum Permissible Energy density (MPE) exists, which, as stated previously, is only 10% of the power density necessary to initiate permanent eye damage. Adherence to the ANSI for definition of eye safe distance necessitates adherence to this conservative NOHD. This extremely conservative standard has been found to be reasonable for civilian, industry, and commercial product laser standards, as well as for IR range finders and visible pointers.

Any particular NOHD figure is further classified and qualified by viewing conditions. These include exposure duration. The 1/4 second blink response was employed for AFRL-measured NOHDs, though today a much more restrictive standard of 10 seconds is being employed at the recommendation of Mr. Sheldon Zimmerman's NSWCDD team. Another condition is the coherent light wavelength to which the eye is exposed. All candidate dazzlers compared by AFRL were within a fairly narrow green bandwidth. The final condition is the consideration of unaided vision versus viewing lasers through amplifying optics, such as binoculars or rifle scopes. All AFRL, and later NSWCDD G73 testing emphasized NOHDs for the unaided eye.

There is an additional parameter that considers the modulation of the laser beam itself. From the perspective of safety, "continuous wave" (CW) is the most permissive. A CW dazzler beam is considered "always on," and peak power/energy density is calculated to be approximately equal to average power/energy density. Representing a more distinctive modulation, a gated dazzler beam begins to take on modest pulse characteristics. A gated beam such as the CHPLD is composed of a train of long pulses having a duty cycle of 50% or greater (laser is "mostly on"), so the peak power/energy density of any given pulse does not exceed 2 X average power/energy density by much. In fact the CHPLD was measured at Laser Compliance to have a duty cycle of 70%, with peak power measured at 633mW and average power measured at 443mW, in effect not much different than a CW laser. The least permissive beam structure would be a "pulse" laser dazzler. In a pulse laser short pulses of high peak power/energy density form a train having a duty cycle of less than 50% (laser is "momentarily on, then mostly off"), so any given pulse greatly exceeds average power, during the short duration of that pulse. With lasers it is the peak energy density that can cause damage before the blink response, independent of the average power. In essence, one would tend to see longer NOHDs with pulse lasers.

Finally, there is the phenomenon of the rise time of any laser when lasing is initiated through trigger pull, especially when the laser is cool. The leading edge of a CW laser step function and the first long pulse of a gated laser train both have a momentary peak power/energy transient that poses the same risks as any short pulse later. In this respect all dazzlers, whether CW, gated, or pulse pose the same potential risks in their worst cases. From a correct testing

stand point there is an argument that all should be penalized equally. Figure 25 below shows a TEM00 beam produced by a single point source. The TEM00 is the lowest order mode possible, with a bell-shaped (Gaussian) distribution of light across the laser beam:

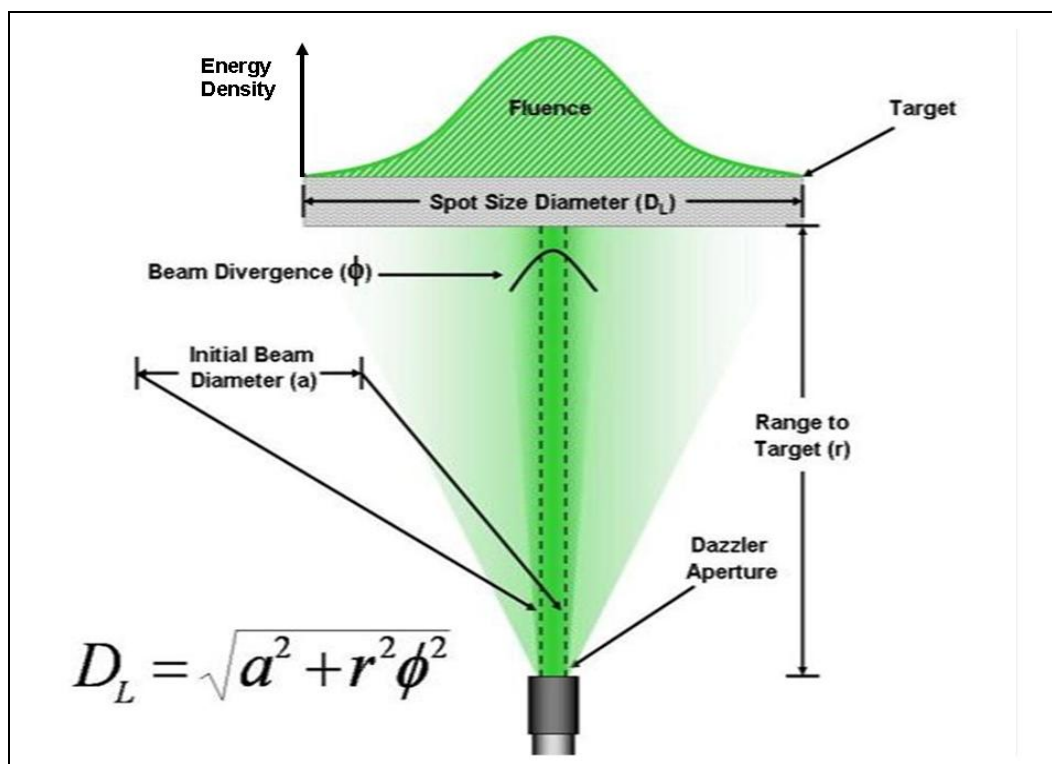


Figure 26. Geometry of a single TEM00 laser beam.

For military dazzlers the operationally logical threshold is that range at which one observes the on-set of permanent eye damage. This would permit utility of the dazzler to be maximized during EOF by allowing it to be employed by the operator it at the closest possible range without causing such damage. It would allow NLW effects every chance to succeed, to prevent the less attractive alternative of lethal force. In the case of military dazzlers the logical threshold is therefore that distance short of which permanent eye damage occurs, which in practice is approximately 1/3 of the ANZI-determined NOHD.

In the case of the GBD-IIIC, a highly collimated (collimation being a function of beam divergence) power smaller sized spot is created at the target. The tighter collimation of the GBD-IIIC is driven by the need to maintain operationally useful power densities on targets down-range. However, as point source the GBD-IIIC must live with the TEM00 Gaussian bell shaped energy distribution that is a natural output of individual, self-consistent coherent beams. In the bell shaped distribution energy density is always biased towards the center of the bell, i.e. its apex at the center of the spot on target. Given this fundamental limitation of a single point source high power is the only means of compensating for power density deficiencies closer to the spot's perimeter:

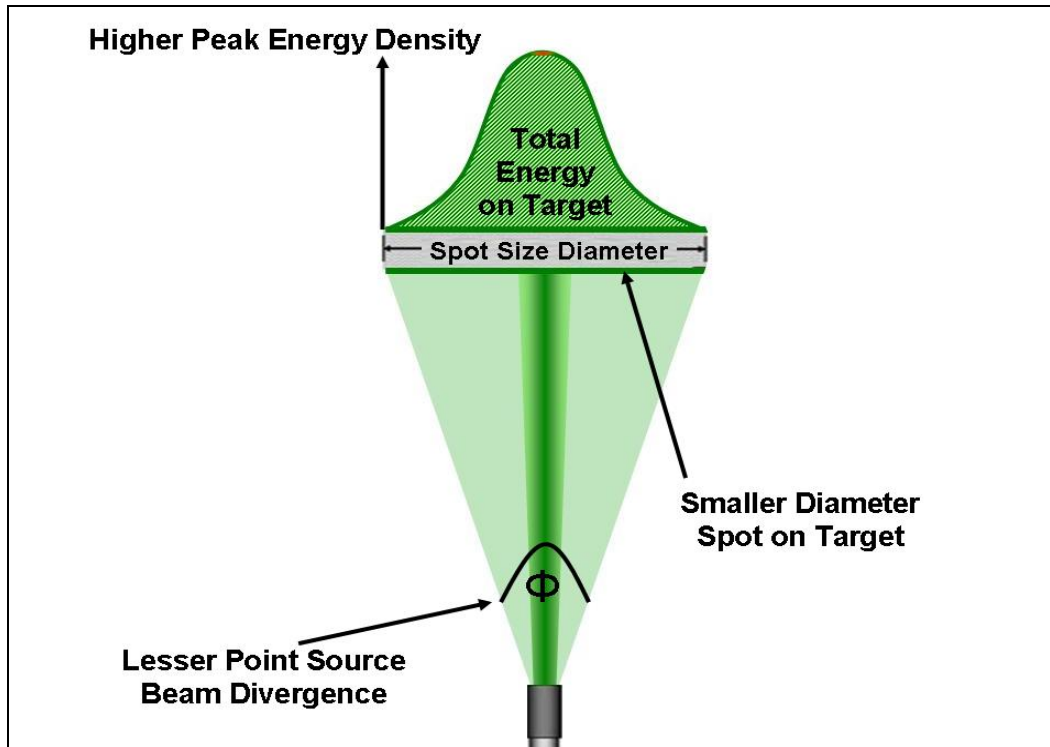


Figure 27. Single beam of a point source, such as the case of the GBD-IIIC.

Alternatively, in the case of the CHPLD, a high average power large sized spot is created at the target due to the summation of the four individual and essentially parallel beams. This summation is referred to as the “superpositioning.” (Figures 28, 29, 30, and 31). In addition to operational redundancy, there are several advantages to this technique. Specifically, the peak coherent energy at any point within the area of the spot on target cannot exceed the peak energy of any of the individual laser beams that contribute to it. This has three reasons.

The first is that the spatial distribution of the parallel sources at the CHPLD aperture will be reflected in a similar spatial distribution down range. NSWCCD stated that a convergence or “focusing” of the CHPLD beams was observed at seven meters. This would have been impossible based on the design of the CHPLD. The NSWCCD G73 observation was shown to be erroneous in Laser Compliance’s test of the CHPLD.

The second reason for this peak energy density cap is that even in a theoretical worst case where the beams converge into an area with the cross-section of a single beam, the off-axis angular convergence would cause partial incoherent cancellation in the summation. In other words the totality of several beams that approach the same spot from different angles is not coherent.

The third reason for this peak energy density cap is that at the wave-length-level of precision, all four laser sources are out of phase with each other. In the end, while the individual point sources are coherent and have neat individual Gaussian energy distributions, their phased-delayed summations on target do not:

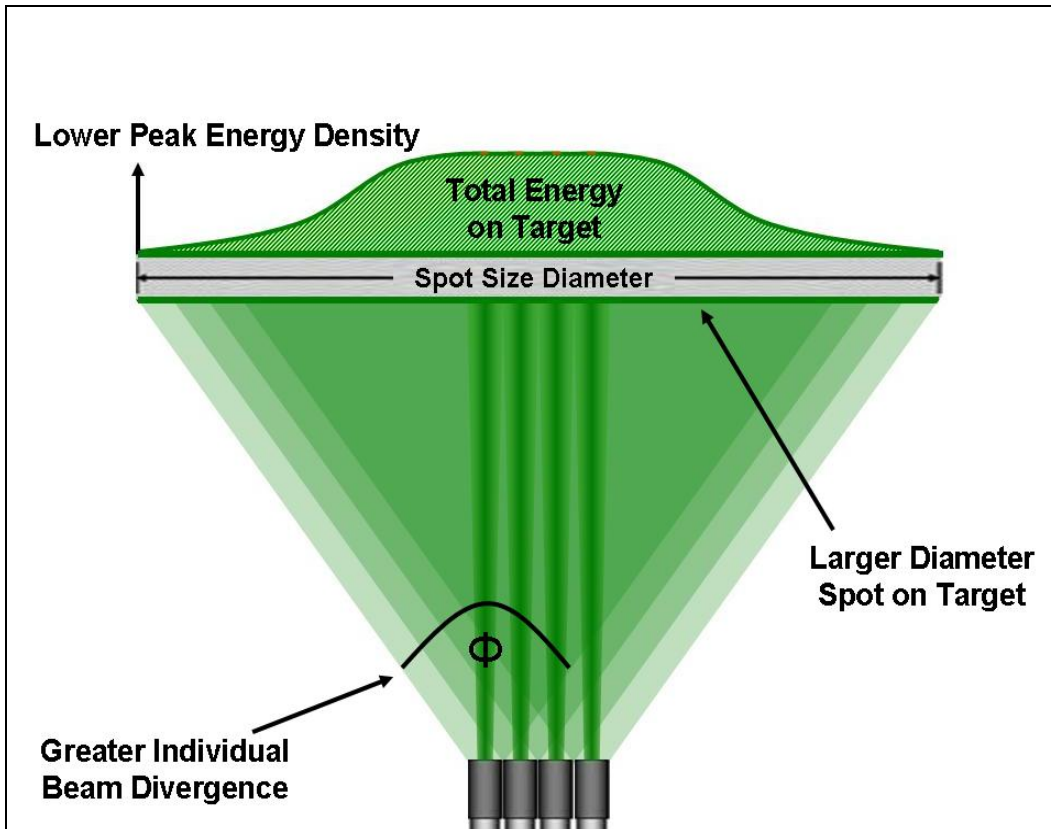


Figure 28. Multi-beam superpositioning on target, such as the case of the CHPLD.

Figures 29 and 30 below are actual photographs taken by the NSWCCD G73 investigators during their first evaluation of the CHPLD. While the investigators' conclusions are inconsistent with the actually observed phenomenon of CHPLD superpositioning, the photos clearly show the effect in practice. The left side photo (Figure 29) was of the four projected parallel CHPLD beams within inches of the aperture. Note that the axes of the parallel beam emissions form a square that is less than two centimeters on a side. NSWCCD G73 reported erroneously that the beams converge to a focal point at seven meters. Laser Compliance independently confirmed that they do not.

The right side photo below shows the visual summation of the superpositioned beams at a distance of eight meters from the aperture. This photograph documents the real phenomenon of superpositioning that Figures 28 and 31 show schematically. It is possible that the G73 investigators mistakenly interpreted the image of Figure 30 as a "focusing" of the four beams at about eight meters (seven meters as reported in the 1st Dahlgren evaluation of the CHPLD). While visual inspection has utility, such simple inspection would not reveal the true characteristics of the image, as it would not be TEM₀₀ in reality, but rather be the complex summations illustrated in Figures 27 and 30. The inability of the NSWCCD G73 investigators to recognize the phenomenon of incoherent superpositioning and apparently confuse the image in Figure 29 as a beam focal point calls into question the technical competencies of the team:

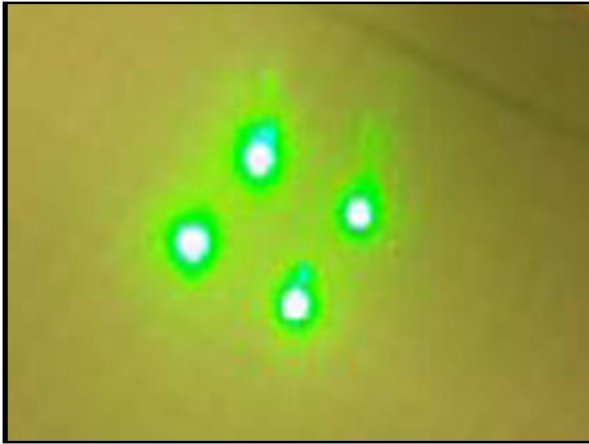


Figure 29. CHPLD beams on engineering pad during 1st NSWCCD test.

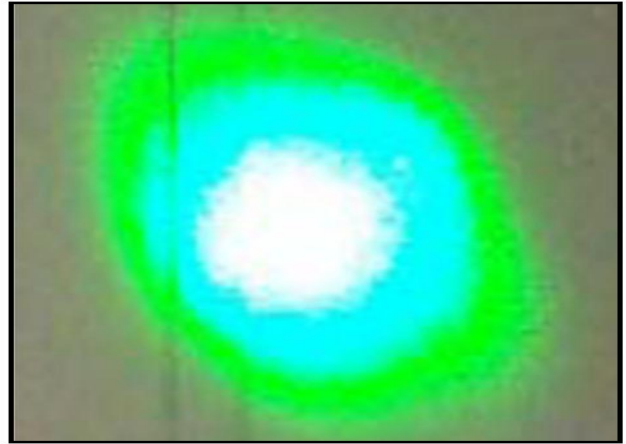


Figure 30. CHPLD beam superpositioning at 8 meters during the 1st NSWCCD test.

In the CHPLD array the total laser power at the aperture is spread out over the four point sources allowing the CHPLD to be employed at closer ranges. This feature combined with the greater individual beam divergence angles creates lower, therefore safer, power densities at closer ranges than a single point source laser device like the GBD IIC, yet provides necessary power densities across a larger spot area at the required operational ranges. In the case of four parallel point sources, only one fourth of the total device power (i.e. the Gaussian energy maximum of one coherent point source) can focus on one particular point on the retina simultaneously, at any range, as illustrated earlier.

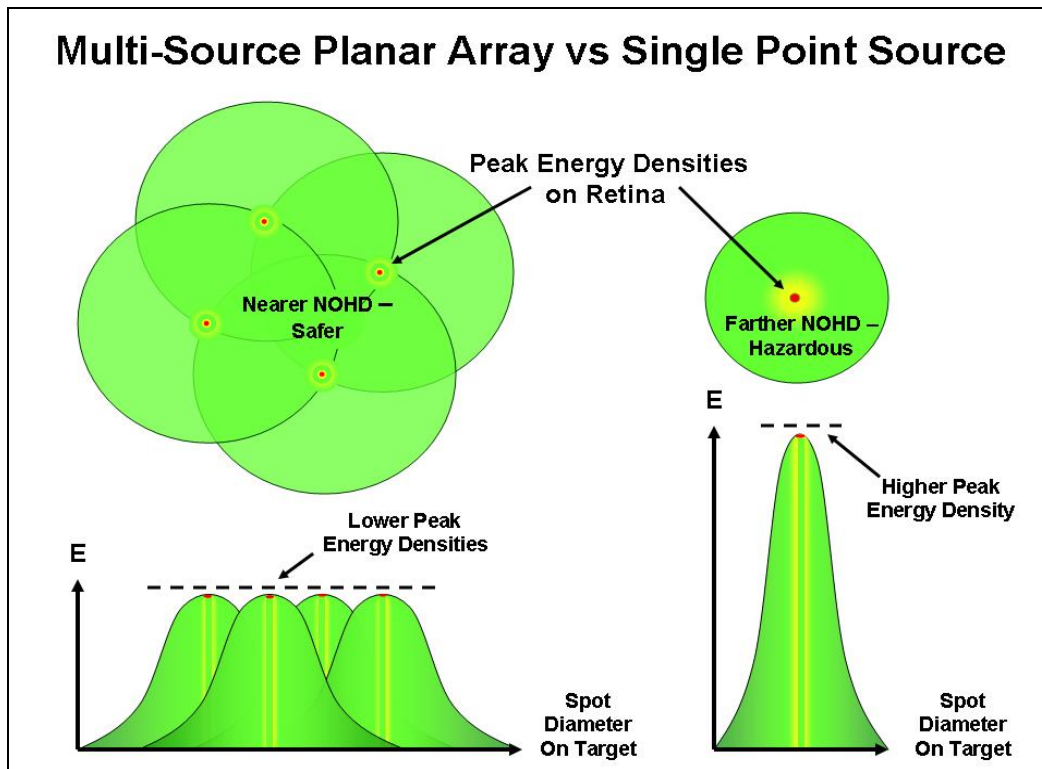


Figure 31. Multi and single point source projections against a vertical plane.

NSWCDD G73 erroneously reported that the CHPLD's four beams converge at approximately seven meters distance from the aperture. Laser Compliance correctly evaluated the four beams as parallel. Nevertheless, beam convergence could be considered the worst case for achieving potentially excessive laser fluence in the eye, and is again worthy of discussion. In the case of a powerful single point source dazzler device like the GBD-IIIC (advertised as 250 mW) the total energy of the one coherent green beam will be focused on a single point on the retina.

However, as illustrated earlier in this case study the angular separation of the four individual CHPLD sources will cause each beam to take a separate path through the lens with a corresponding separate focal point on the retina. The geometry of the CHPLD planar array does not permit the coaxial, much less the in-phase/coherent, propagation of two or more beams along the exact same path. Since the power of the individual point sources of the CHPLD tested by NSWCDD G73 was determined to be 168 mW each in the first test, 168 mW should have been the standard for any simplified calculation of NOHD. Since the GBD-IIIC is advertised as a 250 mW device having a lesser beam divergence angle to produce a smaller spot on target than the CHPLD at any given range, a significantly longer NOHD would be expected. The Dahlgren evaluation was erroneous.

The incorrect power density and peak energy calculations employed by Dahlgren penalized the CHPLD unfairly when compared to the GBD-IIIC. Unlike Laser Compliance's independent evaluation, Dahlgren testers did not measure actual power densities and peak energies at various ranges from the CHPLD aperture. Instead, the CHPLD aperture was treated as a point source. As a consequence, Dahlgren testers did not account for the CHPLD's natural safety advantage over the point source GBD-IIIC, based on the CHPLD's four spatially and angularly separated point sources that permit safe direct exposure closer to the aperture, i.e. a shorter NOHD. Second, the CHPLD was penalized again by being the only laser of the two to be held to the more conservative pulse laser standard, even though it is merely a gated system having a 70% duty cycle, CW-like in practice. On the other hand, the GBD-IIIC was held to the more permissive CW evaluation threshold, even though it has a rise time at turn on as well as a pulsing mode. These errors led to inaccuracies in terms of calculated NOHDs, especially the NOHDs calculated for the CHPLD in both the first and the second NSWCDD G73 tests.

It is unfortunate that the laser subject matter experts (SMEs) at Dahlgren did not grasp the fundamental differences between the two dazzler designs and tailor their testing and calculations accordingly. It is of more significant concern that the technical experts at JNLWD, on the LSRB, and at MCCDC did not question these obvious test flaws when they were presented with various Dahlgren test results over time that were repeatedly founded on the same flaws. The original AFRL testing recorded CHPLD test results and NOHDs that compared somewhat favorably to those eventually measured by Laser Compliance. Those AFRL NOHDs also consistently contrasted with Dahlgren's original and later results.

For whatever reason, this trend of discrepancies between the reports apparently did not interest the LSRB, JNLWD, or MCCDC enough to question the Dahlgren testing. Mr. Land, the JNLWD laser SME, had also been cautioned on two different occasions that the Dahlgren testing

was possibly not above reproach and that an independent test and evaluation agency might provide more defensible results. Evidently, those concerns were dismissed in JNLWD's and MCCDC's determination to field the GBD-IIIC and to shelve the CHPLD that had been requested by both MEFs.

In spite the new information provided by Laser Compliance, many of the dazzler program decisions are irreversible. The alleged superior safety of the GBD-IIIC had been employed in combination with unqualified criticism of the CHPLD's safety by MCCDC to justify a greater than \$3.8M sole source procurement of the GBD-IIIC. More funding was programmed for additional GBD-IIICs and engineering corrections to GBD-IIICs. The total funding expended by decision makers based on their faith in the correctness of the information provided them now likely exceeds \$10M over two years.

As of the submission of this case study the more hazardous GBD-IIIC remains fielded and the safer CHPLD remains prohibited. Furthermore, the LE Systems products continue to be slandered by combat developers, NSWCDD G73, and others. Assurances that USMC would work with LE Systems to correct LSRB-alleged deficiencies have proved to be unfounded, as combat developers have cut off all contact with the vendor.

b. Dazzler production considerations

Creation of green laser light is accomplished through a technique called "frequency doubling," or inversely-stated, the "1/2ing" of the 1064 nanometer (nm) infrared (IR) wavelength. This is a two-stage, two crystal process. The 808 nm light emitted by an initiating diode is passed through the first crystal, creating 1064 nm IR light. This 1064 nm light is then passed through a second crystal, the output of which is 532 nm visible green light, exactly ½ the wavelength of the original 1064 nm initiating diode.

In practice, each individual 808 nm laser resonator exhibits its own optimum power output, i.e. maximum achievable power output before it de-tunes and the power drops, in accordance with diode current and temperature environment. Even initiating laser diodes constructed from identical crystals in identical manufacturing procedures can vary widely in terms of demonstrated optimum power.

Understanding that all green laser resonators are different, manufacturers categorize lasers by demonstrated maximum/optimum power output, and beam quality. Lasers are then divided into lots of like-laser sources, and a particular lot or lots are provided to customers according to their specific requirements. For laser dazzlers measured power is more critical than an ideal Gaussian beam distribution.

Individual lasers can exhibit a much smaller power variance, but this requires active current control combined with photo diode feedback and temperature controls in order to keep the laser at or near its optimum operating range. However, such artificial controls do not negate the fundamentally varying physical properties of the individually produced lasers, they merely adjust those differences after the fact. It is the customer requirement that determines what the

acceptable power tolerance is, and if the added expense of thermal and photo diode feedback current controls are necessary for the application.

This technical information regarding green laser production is common knowledge amongst laser manufacturers and laser subject matter experts, especially the practice of segregating and grouping resonators into lots determined by measured power and beam quality.

5. Discussion 3 – CHPLD Case Study-relevant activities

e. Recent Dazzler press and political activities

Increasingly, middle managers and SMEs at MCCDC, MCSC and JNLWD have become the subjects of investigative journalists including but not limited to Richard Lardner (Associated Press), Alicia Mundy (Seattle Times), David Axe (Defense Technology International), and Chris Castelli (Inside the Pentagon):

(1) Magazine and newspaper articles relating to dazzlers and CHPLD

On 31 Jan 07 Richard Lardner wrote an article (Ref a.1.) for the *“Tampa Bay Tribune”* titled *“Marines In Iraq Decry Lack Of Laser System.”* The article stated in part: *“Civilian casualties in Iraq's volatile Anbar province would have been greatly reduced over the past 20 months if an inexpensive, hand-held laser system had been sent to the Marines operating there... Made by LE Systems... the compact laser creates a wall of intense green light that stops or redirects oncoming traffic by temporarily impairing the driver's vision...In June 2005, Marine Corps leaders in western Iraq filed an "urgent universal need" request for several hundred of LE Systems' dazzlers...The request, which was repeated less than a year later, has gone unfulfilled. Officials at Marine Corps Base Quantico in Virginia cited unmet test requirements, needed safety reviews and questions about the production capabilities of the laser's manufacturer. Marines in Iraq, however, have called those reasons poor excuses that failed to recognize the dangerous environment they're working in. Senior Marines in Iraq are simply unwilling to allow the unnecessary [escalation of force] carnage to continue when [commercially available] solutions are and have been sitting there for years...A military official who spoke on the condition of anonymity said close to 50 innocent Iraqis were killed and nearly 140 were wounded in Anbar between March and December by Marines who did not have the dazzlers as an alternative to lethal force...Anticipating... ‘total process failure’ [I MEF Fwd] bypassed the normal procedures for acquiring gear and used money from its own budget to buy 28 of the lasers from LE Systems...However, officials at Quantico directed the Marine force not to use them...the Marine Corps ‘procured and fielded’ ...the GBD-IIIC, which is built by B.E. Meyers of Redmond, Wash. The Marines in Iraq did not want the Meyers laser...because it is not as powerful or effective as the [CHPLD]...[I MEF Fwd staff members] challenged the objectivity of the government's testing of the LE Systems compact laser, claiming [it] was held to higher standards in an effort to find shortcomings...[a staff member asked] ‘Was the GBD-III treated similarly as it passed through so easily?...Probably not’ ... [a member of MARCENT’s staff wrote to Quantico] ‘I've seen independent reports and other data that seem reasonable that [the Compact High Power Laser Dazzler] is a superior capability...Yet 18 months later you are sole-sourcing to someone else?’...Robert*

Aldrich, a laser safety specialist at Dahlgren naval center [stated the Marine Corps] ‘...never at any time asked for permission to use the system’...[MARCENT staff also] said the Army and U.S. Special Operations Command have approved use of the LE Systems laser and those endorsements should be good enough for the Marine Corps.”

In the March 07 issue of *“Defense Technology International”* David Axe wrote an article (Ref. a.2.) titled *“Slow Down or Else.”* The article stated in part: *“The II MEF filed a ‘Universal Need Statement’ for a Laser Dazzler in May 2005, asking for 400 CHPs and marking the request ‘urgent,’ meaning it wanted them delivered in theater within three months...When MCCDC got II MEF’s needs statement, it sat on it, sending the CHP into a year long period of testing that I MEF personnel say was unnecessary...But despite its use by law enforcement agencies in the U.S. and by other forces in Iraq, the Laser dazzler wasn’t given off-the-shelf treatment; it was treated like an unknown quantity...[A] Marine Expeditionary Force official blames [combat developers] for ‘displaying an aversion to departing from the apparent personal priorities of management if there is no parochial incentive or authoritative direction to do so.”* David Axe would go on to write two additional articles on the USMC dazzler controversy in DTI in Jul 07 (topic SUCAV, including dazzler component [Ref. a.6.]) and various articles on the *“Danger Room”* blog (Dazzler and SUCAV).

Other articles began exploring questions potential connections between the political interests of Washington State, plus-ups directed at BE Meyers, and the GBD-IIIC approval and product improvement process. On 24 Jun 07 Alica Mundy wrote an article (Ref. a.4.) for the *“Seattle Times”* titled *“Marines Request for Lasers Morphs into 2-Year Battle.”* In it she stated in part: *“The Marine Laser Safety Review Board approved the Green Beam in February 2006. In November 2006 B.E. Meyers received \$3.55 million contract to provide green beam lasers to the military. The review board didn’t evaluate the Dazzler until February this year – and then the laser was denied for safety reasons. Officials from B.E. Meyers declined to comment on the laser dispute...LE Systems, said the Marine reviewers didn’t give the Dazzler a fair shake...the final report...says the Dazzler cannot gauge the distance to target...[LE Systems] said such range-finding capability was not demanded of the [GBD-IIIC]... A Marine officer confirmed that the Green Beam does not have a range finder...One reason that it took over a year to get the Green Beam [GBD-IIIC pointer] to troops after its approval in February is that Marines in Iraq didn’t want it. They wanted the Dazzler, said Col. Roger Oltman, a Marine combat development officer in Quantico... [MCCDC] prevailed after warning that money for checkpoint lasers would vanish and troops would end up getting nothing.”* In a follow-up article (Ref. a.5.) on 1 Jul 07 titled *“Senators Want Probe of Weapons Delays,”* Alica Mundy began to focus on the funding issues: *“The 2008 federal budget contains \$7 million for B.E. Meyers to improve its Green Beam laser. The money was added to the budget by Reps. Dave Reichert, R-Auburn [WA]; Jay Inslee, D-Bainbridge Island [WA]; Rick Larsen, D-Lake Stevens [WA]; and Adam Smith, D-Tacoma [WA]...the congressmen’s staffers noted that their bosses became involved only after Meyers had won the Marine contract...Marine officials say they’d like a larger pool of laser suppliers and are in contact with the Dazzler’s [i.e. the CHPLD’s] maker... ‘B.E. Meyers & Co. is the only company producing dazzlers that have been approved’ by the Navy’.”*

On 23 Aug 07 Christopher J. Castelli wrote an article (Ref. a.9.) for *“Inside the Pentagon”* titled *“Competing System Sidelined: Review of Laser Dazzler Used by Marines in Iraq Cites Safety Issues.”* His article focused on the appearance of signs that the GBD-IIIC laser may be more hazardous than claimed by USMC combat development officials in the past. In the article Castelli stated in part: *“A recent review of a non-lethal laser weapon that Marines in Iraq...has underscored the need for stricter safety procedures...The device in question is the B.E. Meyers GBD-IIIC model of the laser dazzler...Reports of ‘possible eye injuries to users resulting from employment of the GBD-IIIC’ led the Marine Corps Center for Lessons Learned to develop a... ‘The consensus of those surveyed was that the GBD-IIIC is effective in preventing escalation of force (EOF) incidents, but that there are possible safety issues... there have been several incidents in which coalition forces have been accidentally ‘lased...’ [JNLWD] said the directorate is ‘unaware of any substantiated eye injuries due to GBD-IIIC use.’ ...B.E. Meyers, said [it] is not aware of any incidents in which there were eye injuries caused by the GBD-IIIC... ‘The device is not a toy and Marines should be conscious of eye safety,’ the newsletter says. ‘Marines should not shine the dazzler in anyone’s face within 114 meters for ten consecutive seconds.’...It was generally agreed the dazzler is more effective at night and it is difficult to aim during daylight hours. The daytime range is only 500 feet (with a visible dot only)... This year, there has been debate within the Marine Corps about whether Marines should instead use a competing product called the [CHPLD], made by LE Systems, which contends military testing shows its product is in some ways safer. Marine officials in Iraq specifically requested the CHPLD in 2005 and 2006. But other Marine officials in Quantico, VA, procured the GBD-IIIC instead ...And, in February, the Navy Laser Safety Review Board refused to approve the CHPLD system. One of the of deficiencies cited in the board’s report on the CHPLD system is an ‘eye hazard distance’ of 121 meters...Lt. Gen. James Amos...defends the decisions...[LE Systems had] accused Marine acquisition officials of anticompetitive practices...Other U.S. military personnel in Iraq use the CHPLD... Although Marines in Iraq initially purchased 28 CHPLD systems to meet an urgent requirement, they were prohibited from using those systems [by Quantico officials].”*

Writing for the *“World Politics Review”* publication (Ref. a.12.), on 27 Nov 07 David Axe wrote an article titled *“U.S. Military Fumbles Requests for Nonlethal Weapons in Iraq, Afghanistan.”* Axe’s article was the first to report the independent testing by Laser Compliance that exposes the questionable technical competence of NSWCCD G73’s testing of the CHPLD. Axe’s article states in part: *“One key need in Iraq, according to Marine Corps Lt. Col. Jimmie Harmon, is to allow troops manning checkpoints ‘to gain the undivided attention of approaching vehicles without risking injury or death of innocent civilians.’ In 2005 Harmon, then deployed to western Iraq, sent an “urgent needs statement” to his commanders asking for \$2 million to buy 400 hand-held green-laser ‘dazzlers’ manufactured by L.E. Systems of Hartford, Conn. The L.E. Systems dazzler can temporarily blind (“dazzle”) at a range of 400 meters...Despite Harmon’s request and others, the L.E. Systems dazzler [has] been held up by bureaucratic waffling ...In the wake of Harmon’s needs statement, the Marine Corps tested two dazzler designs, comparing their...minimum safe ranges before ultimately selecting a dazzler built by Redmond, Wash.-based B.E. Meyers. The Marine Corps’ choice was made against the advice of the Air Force, which had conducted its own testing and believed the L.E. Systems dazzler was safer...Now it appears the Marine Corps was wrong about the relative merits of the B.E. Meyers design...An independent test conducted by Laser*

Compliance, based in Utah, has confirmed...that the L.E. Systems dazzler is much safer. According to Laser Compliance, the L.E. Systems dazzler has a nominal ocular hazard distance of just 30 meters, compared to 70 meters for the B.E. Meyers device. So not only did the Marines have to wait more than a year to get their hands on a reduced quantity of dazzlers, the weapons they ultimately received were of the lesser design.”

(2) 28 Jun 07 Senator Biden and Senator Bond letter sent to SECDEF

The mounting publicity surrounding the dazzler and other controversies related to unfulfilled operator needs were generating Congressional concern in the summer of 2007. In a jointly signed letter (Ref. c.12.) dated 28 Jun 07, Senator Bond and Senator Biden had written to SECDEF. In the letter the Senators expressed concern that “...*the Department is failing to respond to urgent warfighter requirements because of unconscionable bureaucratic delays...In some cases, these delays have literally resulted in the death and injury of U.S. forces and innocent foreign nationals.*” In the letter they highlighted specific systems that had allegedly been delayed, including the requests by both I MEF (Fwd) and II MEF (Fwd) for the Laser Dazzler: “...*unwarranted delay occurred in the case of a request, repeatedly made since 2003, for commercially available laser dazzlers. “...we are troubled that it took 18 months for a commercial product to arrive at the front. We understand that...in a six-month period, up to 50 innocent Iraqi deaths and approximately 130 serious injuries were attributed to U.S. forces lacking a humane non-lethal tool like dazzlers. Even more surprising is that a request from marine operators was denied at the same time that other U.S. forces in Iraq were using the exact same dazzler...we believe that an internal review and the recommendations that flow from it will insure remedial action...we are hopeful that most of the changes can be made internally - - and quickly.*”

(3) 30 Jul 07 CMC response to Sen. Biden (and Sen. Bond)

On 30 July 2007 the Commandant of the Marine Corps (CMC) sent separate letters to Senator Joe Biden and Senator Kit Bond (Ref. 1.8.). CMC’s letter responded to concerns for USMC delays in equipping Marines that the Senators had raised in their jointly signed letter sent to the Secretary of Defense (SECDEF) on 28 June 2007. In his 30 July letter CMC sought to justify MCCDC, MCSC, and Joint Non-Lethal Weapons Program (JNLWP) actions on several urgent needs, requirements, and programs. CMC’s letter included a discussion on the USMC’s alleged delay in responding to the 2005 operator request for CHPLDs. Therefore, an analysis of the CMC’s letter to Congress is a useful framework for this case study of CHPLD, since it constitutes the Marine Corps position on the topic.

It is necessary to point out that CMC’s letter is divided into two distinct parts. The first is his signed letter. The second is an extension of the letter that follows his signature. CMC introduces this section with: “*Enclosed is additional information relevant to your specific concerns.*” This delineation between CMC’s personal signed letter and the extension is critical. It was obvious in researching the CHPLD case study that CMC did not author that additional section. It was certainly prepared by the subject matter experts (SMEs) and civilian and uniformed middle management of MCCDC, MCSC, and other subordinate offices for the CMC. It contains SME-level project and program detail that CMC would have to trust as being factual.

This is all the more true since at the time of the USMC decisions to not fulfill the MRAP UUNS and continue with armored HMMWV solutions Gen Michael Hagee was CMC. Then a LtGen, Gen Conway was on the Joint Staff serving as the J3. This observation is pointed out up front because there are many inconsistencies and contradictions within the letter extension, which CMC conceivably might not have recognized. He must trust the details that are presented to him for signature as an executive generalist, as do all General Officers. The 30 Jul 07 CMC letter and additional information stated:

(a) Cover letter, and cover letter analysis

CMC's letter to the Senators began: *"Thank you for your letter regarding the Marine Corps' accelerated acquisition process. The Secretary of Defense asked me to provide you information on how the Marine Corps is leaning forward to provide Mine Resistant Ambush Protected vehicles and enhance our persistent surveillance capabilities in support of Marines in Iraq and Afghanistan."*

The Marine Corps' responsiveness to requests from Marines in Afghanistan and Iraq for new or improved equipment to meet emerging threats continues to be a matter of utmost concern. The key is to balance the rapid fielding of new capabilities with a host of other variables - among them the maturity of the technology, the ability of the industrial base to develop the capabilities in sufficient numbers and on an accelerated schedule, and finally, the logistics system to adequately support the capability once fielded."

1 A question worth asking is: who balances these issues? Is it accomplished by operationally and technologically-savvy (i.e. bilingual), programmatically neutral government personnel with relevant physics, engineering, or computer science insight? Is it accomplished by neutral government personnel who have a true insight into the state of the commercial art and industry capacity? Or is it overwhelmingly accomplished by acquisition and process specialists within the support establishment who have tangible programmatic interests in the outcome of decisions. These specialists who manage USMC combat development include non-promotable twilight tour officers, retired Marines working as civil servants at MCCDC, MCWL, MCSC, and ONR, and familiar contractors who also have a large stake in the outcomes of decisions.

2 The balance has been wrong, and short of fundamental, verifiable institutional change it will remain wrong. Instead, the balance is clearly in favor of USMC support establishment staff vision of programmatic exigency and MCCDC-driven priorities, as opposed to warfighter-driven priorities.

CMC's letter to the Senators continued: *"The Marine Corps recognizes that the current requirements and acquisition processes have not been perfect in meeting all the needs of our combat forces and we are taking steps to improve our methods. Continued involvement of senior leadership, revisions to our urgent needs review process, and increased engagement with other Service efforts and industry will allow the Marines Corps to increase the responsiveness and effectiveness of delivering critical capabilities to the warfighter. The*

timeliness and importance of this effort is well understood, as Marines who work rapid acquisition issues on a daily basis are themselves warfighters, many only recently returned from combat action in Iraq and Afghanistan.”

1 What are those improvements, revisions, and increased engagement mechanisms specifically? Also, the civilians in the CDIB, SYSCOM, MCWL, and JNLWD who are depended upon for continuity and subject matter expertise, are not operationally current or technologically proficient. Similarly, many if not most of the CDIB, SYSCOM, MCWL, and JNLWD active duty officers have been on extended ‘homesteading’ twilight tours at Quantico and cannot be considered warfighters.

2 Generals are “generalists” by design and effectively less pivotal in the needs fulfillment equation. And the weaker the background of the generals with regards to technology and opportunities the more they become the tools of the SMEs. These tenured USMC middle management and junior SME individuals, having repeatedly exhibited value sets, incentivization, and concepts of “urgency” divorced from the best interests of both warfighters and the future of the Corps, have a record of providing bad advice to Marine Corps General Officer leadership. This bad advice has done real, measurable damage to both the Corps’ and the country’s national security objectives. As the USMC “experts” they knew better, even though the negative operational outcomes were reasonably predictable.

3 In the end, just having warfighter generals assigned to MCCDC leadership means little. Much deeper and lasting institutional change is needed to correct the staff advisory bodies beneath the generals in order to prepare the USMC for the future. Warfighter-led systems decision making is worthy of consideration:

CMC’s letter to the Senators concluded: *“Enclosed is additional information relevant to your specific concerns. A similar letter has been sent to Senator Bond. I want to personally thank you for your interest in supporting our deployed forces and for your continued support of the Marine Corps.”*

(b) “Additional information,” and analysis

As it pertains to the Dazzler, the extension to CMC’s 30 July 2007 letter containing additional information stated: *“In July 2005, the Commanding General of II Marine Expeditionary Force (Forward) (CG, II MEF (Fwd)) in Iraq submitted an UUNS requesting 400 laser warning systems that were sold by LE Systems (known as “laser dazzlers”). The lasers would be used to provide visual warning to vehicles approaching military roadblocks and other secured areas. In response to this request, Marine Corps Systems Command (MCSC) and the Joint Non-Lethal Weapons Directorate (JNLWD) evaluated the lasers of four manufacturers: BE Meyers, LE Systems, XADS, and Apogen Technologies. The lasers developed by BE Meyers and LE Systems were selected for further evaluation.”*

1 An analysis of this assertion reveals: As noted in the case study above, immediately following the summer 05 Air Force Research Lab evaluation of the laser

products noted above, the USMC NLW requirements official formally recommended that the USMC sole source purchase of BE Meyers GBD IIIC, even though the AF tests showed the CHPLD to be safer and more effective. Again, the II MEF and I MEF operators both specifically wanted the CHPLD for its larger spot size on target and closer safe employment ranges. MCCDC's (Mr. Grundy, USMC NLW Requirements) premature 1 Oct 05 formal statement of preference for the sole source purchase and fielding of the BE Meyers GBD III has guided all subsequent programmatic decisions. As observed in the case study above, it set in motion competition-stifling practices that continue to this day on the issue of laser dazzler.

2 The curiosity of this early combat developer preference BE Meyers has led to several journalists investigating the circumstances of a costly 18 month delay in fielding a COTS product that was never requested. Subsequent Congressional mark-ups for improving the safety of what has now operationally proven to be a less than safe GBD IIIC device generated the press interest. The combat developer's continuing refusal to allow the MEF (Fwd) to employ the safer CHPLDs it had purchased directly from the vendor in 2006 only serves to amplify the press interest.

The extension to CMC's letter containing additional information continued: ***“LE Systems notified the Marine Corps that their compact high-powered model was not ready for production or technical evaluation as the prototype was being reconfigured.”***

1 An analysis of this assertion reveals: There is no known correspondence from LE Systems stating the company could not provide the USMC with a CHPLD for production or evaluation. The only recollection of LE Systems is a 2005 call from SYSCOM (Maj Roper) asking for a CHPLD for testing within one week, unreasonable by any standard. Following this SYSCOM interaction the USMC cut off communications with LE Systems in spite of repeated documented attempts by LE Systems to contact JNLWD and SYSCOM. MCCDC, SYSCOM and JNLWD coached and guided the GBD IIIC modified pointer of BE Meyers through to fielding approval in the absence of CHPLD or any other competitor, as a sole source. The production claim in the CMC letter appears to be a fabrication that obscures a lack of combat developer communication with the vendor and eventual dismissal of the CHPLD.

2 Only I MEF's continued determination to obtain the more capable and safer CHPLD kept the CHPLD alive in 2006. This culminated in I MEF (Fwd's) open purchase of 28 CHPLDs directly from the vendor using O&M funding and Quantico, followed by a combat developer prohibition on their employment. It is worth noting that LE Systems produced and delivered the 28 CHPLDs to I MEF (Fwd) within less than eight weeks of receiving a warfighter contract. All were shipped and most received even before the first GBD IIIC was signed for in Al Anbar.

The extension to CMC's letter containing additional information continued: ***“When the LE Systems laser was eventually available for evaluation, it did not meet the requirements of the Department of the Navy's laser safety review process. The BE Meyers laser was approved by the laser safety review board for use against operators of a potential threat vehicle within certain operational limitations.”***

1 An analysis of this assertion reveals: All Naval testing of the CHPLD since the 2005 combat developer decisions to sole source the GBD-IIIC have generated suspicion. First, the LSRB employed stringent and operationally irrelevant standards based on calculations and administrative labeling rather than user exposure and preference, like other NLWs. It is noteworthy that the GBD IIIC and the CHPLD were held to different standards by NSWCCD G73 and the LSRB, as both organization gave the appearance of displaying a tendency towards product partiality. A suspicion of impropriety was most pronounced in CG, I MEF and DC, CDI's expressions of concern in 2007 with the LSRB. LtGen Mattis as CG, I MEF and LtGen Amos as DC, CDI openly questioned the motivations of the LSRB in contentious e-mails.

2 As it pertains to real operational safety considerations, it is noteworthy that eye injuries resulting from the employment of the GBD IIIC have begun to be reported in unclassified Marine Corps Lessons Learned periodicals. It is also noteworthy that the neutral Air Force testing as far back as 2005 had also shown the CHPLD to be safer than the GBD-IIIC in side-by-side comparisons. Still, MCCDC persists in sole sourcing the BE Meyers device and committing substantial funding to correcting safety shortfalls with plus-up funds directed to Washington state based BE Meyers.

3 There is also a significant collection of examination-based medical documentation that stretches back several years documenting the eye safety of the CHPLD following the exposure of multiple employees to hundreds of CHPLD exposures at operationally meaningful close ranges. Several government employees have also been safely exposed to the CHPLD. Army Special Forces who have experience with the CHPLD also speak of the CHPLD's. The CHPLD employee exam records have been repeatedly provided to the Quantico support establishment. Their receipt has not been formally acknowledged, though I MEF did benefit from this safety evidence at the time of its open purchase. The GBD-IIIC can claim no similar record, and recent safety issues in theater are revealing.

The extension to CMC's letter containing additional information continued: ***"The CG, I MEF (Fwd) was notified of the challenges to continued evaluation of the LE Systems laser yet maintained the request for the LE Systems laser. A great deal of effort was expended to meet the specific request of the warfighter for the LE Systems laser."***

1 An analysis of this assertion reveals: CG, I MEF (Fwd) was notified, but great effort was expended to meet the specific request of the warfighter for the LE Systems laser. In fact combat developers obstructed the specific request of the warfighter for the LE Systems laser at every turn following MCCDC's (Mr. Grundy, USMC NLW Requirements) 1 Oct 05 formal statement of preference for the sole source purchase and fielding of the GBD-IIIC. This written comment was made and widely disseminated in spite of the fact that the only testing to that date at that time (AFRL's) had shown the LE Systems CHPLD to be both safer and more effective of the two. The combat developer insistence on an inferior and potentially less safe device over the protests of the Marines in theater led directly to an 18 month delay in the fielding of any capability, a delay that has had consequences in terms of both innocent lives lost and America's image in Al Anbar.

The extension to CMC's letter containing additional information continued: ***“Based on the operational similarities of the BE Meyers and LE Systems devices and the findings of the laser safety review board, the decision was made to provide the BE Meyers laser to the warfighters in Iraq.”*** An analysis of this assertion reveals: The designs and resultant operational dissimilarities between the GBD IIIC and the CHPLD are significant. The safer and superior performance of the CHPLD is accomplished through two design features. In total, the CHPLD is approximately three times more powerful than the GBD-IIIC. However, the power is distributed over a larger area, both on target and at the aperture of the device. This higher power allows a more rapid beam divergence that creates an operationally useful, larger diameter spot size on targets while maintaining a power density sufficient to cause glare day and night at operational ranges. The multiple point sources, each of lower individual power and spread across the CHPLD aperture also leads to a much safer NOHD than single high power point source devices such as the GBD-IIIC pointer. It was these features that the MEF (Fwd)s were seeking when they originally requested the CHPLD in the II MEF (Fwd) 2005 UUNS and then again in the I MEF (Fwd) UUNSs in 2006.

The extension to CMC's letter containing additional information continued: ***“As of June 2007, 250 BE Meyers lasers have been distributed to the operating forces, and the balance will be distributed at a rate of 50 per month through August 2007. The CG, II MEF (Fwd) continues to indicate his satisfaction with the BE Meyers laser. He has requested an additional 725 of these lasers.”*** An analysis of this assertion reveals: It is noteworthy that eye injuries resulting from the employment of the GBD IIIC have begun to be reported in the unclassified Marine Corps Combat Lessons Learned (MCCLL) periodical. More detailed incident and medical reporting is available in classified correspondence. Those incidents reported have involved fratricide. Others, particularly those involving engaged Iraqis conceivably may go under or unreported. As a result of initial hazard reports restrictions have been imposed on the use of the GBD-IIIC that limit the useful employment options for the GBD IIIC that run contrary to the flexible non-lethal intent of the II MEF (Fwd) and later the I MEF (Fwd) UUNS documents.

The extension to CMC's letter containing additional information continued: ***“We have contacted the U.S. Army and understand that they have not authorized the use of the LE Systems CHPLD laser dazzler.”***

1 An analysis of this assertion reveals: In fact, U.S. Army forces within the ARSOC component of SOCOM have been employing nine (9) CHPLDs to great user satisfaction in Iraq for over a year. The CHPLDs continue to be used in Iraq with systems deployed individually or in combination with the LRAD 500 directional communications capability. LE Systems has received reports from the field that employment of the CHPLDs has saved the lives of numerous Iraqi citizens as well as US soldiers. US Navy SEALs have also purchased one CHPLD, however the LSRB stance has prevented any further procurements. Unlike the BE Meyers GBD-IIIC, there have been no reports of injuries or suspected injuries documented by ARSOC with the CHPLD.

2 With respect to the LSRB, in a 20 Apr 07 letter (Ref. 1.7.) to the Mr. Ti Casazza, the President of LE Systems, LtGen Amos responded to Casazza' letter (Ref. 1.6.) to the CMC of 9 Apr 07. In it LtGen Amos stated: *"...I am confident that the Marine Corps has taken appropriate action in accordance with Federal Acquisition regulations. I am also satisfied that the Naval Laser Safety Review Board conducted technical evaluations of competitive designs meeting the guidelines contained in [the]...Navy Laser Hazards Control Program...In the interest of safety, it is imperative that MCCDC, MCSC, and the LSRB follow established procedures to ensure that any laser considered for procurement is thoroughly evaluated to meet legal, treaty, human effects testing, concepts of operation, rules of engagement, and safety validation requirements before source selection and fielding."*

3 The case study above shows that the drafters of the letters that CMC and DC, CDI signed did not provide their superiors technically competent and accurate information, especially as it pertained to the role of the LSRB. Quantico did not move urgently with the dazzler system that documents show was preselected on 1 Oct 05. Combat developer obstruction imposed an 18-month delay in fielding any COTS system to the GCE, with the first device signed for by an operator in Al Anbar in January 2007. When combat developers finally did field the capability defended in the letters it turned out to be a less safe and less effective device than the COTS alternative that the warfighters had urgently and repeatedly requested in the first place.

4 Separately, it is worth noting that a senior officer from the MARCENT staff took a CHPLD device into theater and placed it in the hands of MEF users as early as 2 Jun 06. In an e-mail to LE Systems (Ref. e.2.) he wrote: *"...I was able to use the 'test system'...during a recent trip to work with the Marine Corps operating forces in Iraq... in May 06, I introduced the device to Marines at Al Asad. We mounted the device on M4 and M16 rifles with no difficulty. It remained stable during normal tactical firing sequences (single shot, 3-round bursts and magazine changes). My assessment, from my experience and discussion with the Marines, who were all experienced convoy riders, the device had significant potential for hailing vehicles day and night, in order to discourage drivers from getting too close to convoys. I look forward to being able to employ the device on convoys and at Entry Control Points in the near future."* CMC's and LtGen Amos' letters did not point out this initial USMC operator experience and satisfaction with the CHPLD, an omission again attributable to the authors of the letters signed by both Generals.

(c) Summary observations on CMC's letter and additional info

In conclusion, the CMC was underserved by those who authored the dazzler-specific comments in the extensions of his letters to Senator Biden and Senator Bond. The DC, CDI was similarly underserved by the authors of his letter to LE Systems, one that was intended to be a formal and defensible communication.

f. JNLWD and MCCDC patterns regarding the handling of NLW requests

(1) Long/Mid-Range Acoustic Devices (LRAD/MRAD) parallel at MCCDC

The purpose of this LRAD/MRAD discussion is to illustrate how another NLW capability requested in various documents including UUNS that shared many parallels with the CHPLD. Specifically, the parallels are drawn in the handling of the LRAD and MRAD requests by the Force Protection Integration (FPI) Branch in the Combat development Directorate (CDD) at MCCDC.

For certain FP and the most basic IO functions, the simplistic vocabulary and limited phrases provided by the Phraselator were extremely useful in 2006. In the realm of force protection simple warnings and instructions would have to be given acoustically from a longer distance, and with sufficient directionality so that individuals and small groups knew that they were the intended message recipients. These one-way messages would either achieve a cooperative target reaction when intentions were innocent, or alternatively they would confirm hostile intent and thereby contribute to PID so as to justify the application of lethal kinetic force. For this purpose, compact, lightweight, and highly directional acoustic communications devices were needed that could be integrated with the Phraselator. The Long Range Acoustic Device (LRAD) (LRAD 1000) and later the Mid Range Acoustic Device (MRAD) (LRAD 500), both COTS products of the American Technologies Corporation (ATC) were sole-source capabilities in this regard.

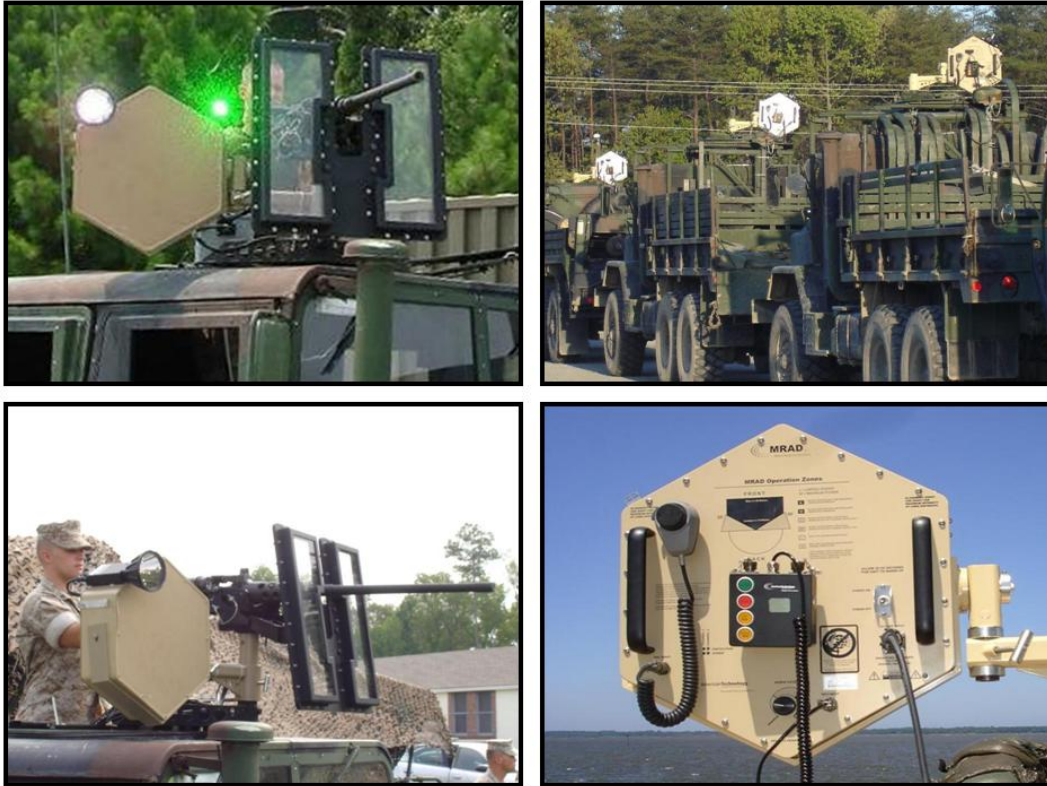
In April 2003 in an e-mail to CG, MCCDC, CG, 3rd MAW from within theater recommended acoustic non-kinetic capabilities to thwart specific threats non-lethally. Later, in an Aug 03 letter to DC, CD calling for USMC collaboration with OFT on Project Sheriff, CG, 1st Mar Div asked for a combined arms suite that included the LRAD component. This was followed by a letter from CG, II MEF to CG, MMCCDC endorsing the 1st Mar Div letter. In his endorsement CG, II MEF specifically called out the need for the LRAD. Those early expressions of need for LRAD and directional acoustics did not lead to MCCDC requirements development or USMC S&T Program investment in LRAD or LRAD-follow-on capabilities.



Figures 32 and 33. LRAD 1000 in CA, and LRAD 500 at the I MEF (Fwd) HQ in Al Anbar.

On 14 Oct 04 CG, II MEF signed an UUNS that called for the rapid development and fielding of a Full Spectrum Effects Battle Weapon (FSEBW) in support of OIF-3. The FSEBW integrated a full spectrum of lethal kinetic, non-lethal and acoustic COIN communications tools aboard a Light Armor Vehicle (LAV). The individual components of the integrated system included both mature COTS capabilities and developmental items of lower Technical Readiness Levels (TRLs) that could be accelerated from the lab and into the field, given additional USMC resources. With respect to LRAD the FSEBW stated “...***needs to include the Long-Range Acoustic Device (LRAD) hailer fully integrated with the DARPA-developed 1-Way Phraselator real-time translation capabilities for long-range verbal commands in local languages...***” The LRAD COTS product and the DARPA Phraselator were mature and being employed by Joint forces in OEF and many Army units in OIF. MCCDC combat developers passed on the FSEBW UUNS fulfillment. Furthermore, MCCDC did not make any technology investments that would have led to the integrated capability later, or fund any of the COTS COIN-enabling components such as LRAD and language translation systems that could have been deployed as stand-alone capabilities.

On 28 Jul 05 the Commanding Officer of 3/6, signed an UUNS requesting a Long Range, Non-Kinetic, Non-Lethal Weapon (LRNLW) (Ref. r.13.). 3/6 was due to deploy to the II MEF (Fwd) AOR within the coming week. Personnel from the battalion were well aware of the success that other II MEF (Fwd) and Joint units were experiencing with non-kinetic optical and acoustic systems, including the LRAD and Dazzlers. The purpose of the UUNS was to ensure that when the CHPLDs and any future LRADs were procured by USMC and shipped to theater that the Battalion would both help with defining the integrated combined arms design and also guarantee delivery of some systems to 3/6. The description of the 3/6 need stated in part: “***3/6 has an urgent operational need for a man-portable Long-Range, Non-Kinetic, Non-Lethal Weapon (LRNLW)...Recommendation. Provide 6 COTS integrated LRNLWs possessing L/MRAD, Phraselator, HPWL, and Green Laser Dazzler, and provide funding for the time critical material release, fielding and sustainment.***” As with the II MEF (Fwd) UUNS that preceded it, the 3/6 UUNS was not acted upon by MCCDC. As with the FSEBW UUNS that preceded it, the LRAD COTS product and the DARPA Phraselator were mature and being employed by Joint forces in OEF and many Army units in OIF. MCCDC combat developers passed on the fulfillment of the COIN-enabling LRNLW as well.



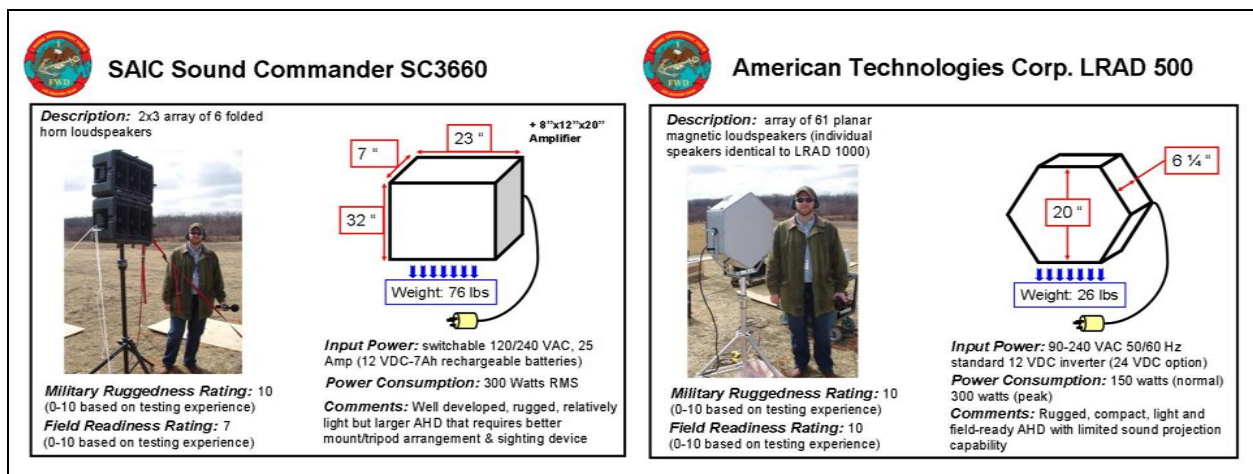
Figures 34 - 37. MRAD (i.e. LRAD 500) integrated within full spectrum weapons suites.

On 26 Jun 06 CG, I MEF (Fwd) signed an UUNS requesting 28 Long Range Acoustic Devices (LRAD). In detail they requested a mix of LRAD 1000s and LRAD 500s, with the LRAD 1000 constituting a longer range system and the MRAD being a smaller, lighter, and operationally more robust. The 28 LRADs were specifically requested due to their relatively compact planer configuration permitting flexible mounting aboard multiple platforms, their extremely directional sound propagation characteristics, and their array simplicity allowing for multi-channel complex mixing permitting the creation of a non-lethal dissuasive mode. Like the dazzler issue, I MEF was aware of LRAD and its uniqueness through market research and hands on familiarization. Like dazzlers, LRAD had also been a component in the II MEF UUNS for F-SEWS submitted 14 Oct 04. Since I MEF (Fwd) was familiar with the obstacles that F-SEBW had faced in seeking validation, the material solution desired was precisely defined in the UUNS for unambiguous clarity, this time asking for the LRAD-enabled directional acoustic capability. The LRAD and its compact sister system the Medium Range Acoustic Device (MRAD) (a.k.a. LRAD 500) were known to I MEF (Fwd) to be COTS products that could be produced in the requested quantities within the UUNS delivery timeline of 90 days (Ref. r.14.).

I MEF (Fwd) was aware that Joint Forces were successfully employing LRADS and MRADS in operations. The Army's Rapid Equipping Force (REF) has successfully fielded some to Army forces in Iraq and elsewhere. It has been widely acknowledged that the LRAD and MRAD readily lend themselves to integration with other non-kinetic NLW such as collimated white lights and dazzlers, more so than other acoustic systems. Unfortunately, instead

of executing the I MEF Fwd request as it was submitted for speed of fulfillment, it the MCCDC Force Protection Division sought a different outcome.

The Force Protection Division also had an institutional and programmatic interest in promoting the Sound Commander SC3660. Personnel there had previously made an independent determination, prior to the generation of OIF UUNs related to acoustic hailing devices and NLW, that the Sound Commander SC3660 was what the operating forces needed. So, second-guessing the I MEF (Fwd) need as it had done with the II MEF FSEBW UUNs and the 3/6 LRNLW UUNs that preceded it, instead of fielding COTS LRAD, the MCCDC NLW program asked for a side-by-side test. In a Limited User’s Military Assessment (LMUA) the LRAD and MRAD were compared to a number of other sound systems, including the MCCDC’s Sound Commander. Penn State University ARL was contracted through the JNLWD to conduct the evaluation:



Figures 38 and 39. I MEF (Fwd) report extracts showing superior characteristics’ of LRAD 1000.

The result of the evaluation was that the MRAD (a.k.a., LRAD 500) was rated as the number one choice for check point and vehicle mounted applications in the Final Report, i.e. the missions that I MEF Fwd was considering for that system even before the evaluation. The Executive Summary of the ARL report states that the LRAD 500 (a.k.a. MRAD) was rated as the number one, and the Figure 43 matrix is copied from the actual report (highlights by the author):

AHD Ranking	Large Ship and Area Applications	Small Boat, Vehicle and Check-point Applications
1	SC3660	LRAD 500
2	PSAIR42	PSAIR42
3	MAD LTPMS 54	SC3660
4	-----	MAD LTPMS 6

Figures 40. Extract from the PSU ARL “Acoustic Hailing Device (HD)” evaluation report.

In and of itself, this superfluous comparative test caused a significant delay in any provision of any material solution to the I MEF (Fwd) UUNS. Because the requesting unit was actively engaged in combat one would expect the NLW program developer to immediately provide the requested systems. Instead, as evidenced in a MCCDC UUNS status message of 24 Aug 06, the MCCDC NLW Program chose to mis-represent the evaluation report results to I MEF Fwd in formal message correspondence.

On 17 Aug 06 the MCCDC CDD forwarded a message to the I MEF (Fwd) G-9. It stated that the PSU ARL side by side evaluation of the Sound Commander 3660, LRADs, and other devices revealed that the Sound Commander was the superior device. Specifically the forwarded MCCDC message stated: ***“Conclusion: The Sound Commander SC3660 greatly out performed the LRAD and PSAIR42 in head to head COMPARISONS. Additionally the Sound Commander SC3660 provides more sound projection capability for less cost.”*** In that message, no mention was made of the actual “number one” ranking of LRAD 500 for the missions and applications of interest to the MEF (Fwd). This misrepresentation was accompanied by an implied threat of additional delays in fielding if I MEF (Fwd) insisted on the LRAD path. The message continued: ***“If the LRAD is the only solution to the MNF-W UUNS, fielding will require in excess of \$1M, which is currently unavailable for rapid procurement...Realignment of the additional funding would entail a significant delay in fielding IOT seek MROC approval and identify additional funding sources”*** This statement is again evidence that the actual operational need is less important than the discomfort that combat developers experience with bureaucratic adjustments to their PORs. Finally, the message requested I MEF (Fwd) feedback on the MCCDC decision: ***“Request I MEF provide concurrence or non-concurrence (with supporting rationale) as appropriate...Concur/non-concur requested NLT 20060901 for re-brief to CDIB.”*** (Ref. e.3.).

On Aug 29, after having had a chance to view the actual PSU ARL evaluation report, the A/CS G9 for I MEF (Fwd) fulfilled the MCCDC requirement for a response. In that e-mail the G9 stated: ***“In short, the I-MEF (FWD) does not concur with the proposal made in the STATUS OF THE OIF-III MNF-W LONG RANGE ACOUSTIC DEVICE (LRAD) URGENT UNIVERSAL N message dated R 241320Z AUG 06. The supporting rationale is contained in the power point brief attached to this email.”*** (Refs. e.5. and p.3.). It is noteworthy that neither the MRAD nor the SC3660 were provided to I MEF (Fwd) by MCSC or MCCDC prior to RIPTOA in Feb 07. Instead, I MEF (Fwd) ended up open-purchasing 28 MRADs with O&M funding to fulfill its own requirement.

Similar to the dazzler case, MCCDC Force Protection Division had made an independent determination, evidently prior to the generation of OIF UUNSs, related to acoustic hailing devices (AHD) and acoustic NLW applications. MCCDC had predetermined that the Sound Commander SC3660 was what the operating forces needed. When confronted with the I MEF Fwd UUNS that refuted MCCDC presumptions and decisions to which they had already committed resources, MCCDC managers conceived a means to guide the user back to the Sound Commander, instead of fulfilling the need. This was done by means of the PSU ARL side-by-side evaluation that had been hoped to independently confirm MCCDC’s previous unilateral programmatic decisions, made in an operational vacuum.

However, to the dismay of MCCDC Sound Commander champions, the PSU ARL evaluation did not confirm the MCCDC NLW Program's presumptions and sided with the I MEF (Fwd) user perspective, as the LRAD 500 was ranked as "number one" for vehicle mounted and check point applications. Unwilling to yield to the urgent needs of the MEF (Fwd) blatantly misrepresented the test results to reflect the MCCDC view. In the end neither the LRAD 1000 nor the LRAD 500 were delivered to the MEF (Fwd) by MCCDC or MCSC. Furthermore, no individual in the combat development process was held accountable for the deliberate official misrepresentation of the test results.

In summary, the blatant lack of MCCDC logic in handling the I MEF (Fwd) LRAD UUNS very closely paralleled the handling of the CHPLD by the same requirements personnel in the same organization. A well-researched MEF-requested sole-source-enabled capability was again delayed and denied because the developer had a preferred vendor and POR, even though the MCCDC preference did not fulfill, and was specifically rejected by the MEF. LRAD and CHPLD are symptoms of a clear trend at MCCDC.

(2) Possible "StunStrike IOD" proprietary information sharing by JNLWD

The purpose of this StunStrike Improvised Ordnance Detonator (IOD) discussion is to illustrate how a proprietary technology introduced to JNLWD personnel by Xtreme Alternative Defense Systems (XADS) employees at an otherwise government-only meeting may have been improperly transferred to a competitor of XADS. As noted earlier, a similar case of JNLWD personnel possibly sharing proprietary information on a product with a competitor was suspected by vendors who asked not to be identified. As with the dazzler issue discussed earlier, no improper sharing of proprietary information or wrong-doing of any kind can be substantiated by the author of this case study. At the same time, if compelling parallels are identified it is worthy of IGMC attention in order to resolve any remaining industry suspicions.

In 2004, XADS converted their patented "StunStrike" non-lethal, directed, tunable, artificial lightning weapon, into an Anti-IED detonator for immediate counter IED applications in Iraq and elsewhere. The system was (and is) called the StunStrike IOD. It was on 15 Jun 04 that XADS first converted StunStrike for employment as an IED neutralizer or pre-detonator. On June 24, 2004 XADS submitted the converted StunStrike technology as a Small Business Innovation Research (SBIR) quick-response topic for Anti-IED technologies in response to a solicitation from the Office of the Secretary of the Navy. In the same response, XADS also submitted a proposed Anti-RPG capability.

On 16 Jul 04 XADS presented its IOD concept to the USMC during its briefing of the StunStrike NLW at the JNLWD's 6-month review of the StunStrike NLW program. At the meeting members of the Joint Non-Lethal Weapons Directorate were present, most notably Mr. Carlton Land. Mr. Land was known to have relationships with other vendors who purported to have electrostatic discharge (ESD)-related NLW technologies and concepts, like those of XADS. Most significantly, he was known to have had a preexisting relationship with Ionatron as a consequence of Ionatron's laser induced plasma channel (LIPC) directed ESD NLW developmental efforts, possibly with JNLWD support.

On 26 Aug 04 XADS was awarded a Phase 1 SBIR Contract for Anti-RPG technologies by the DoN, but was turned down on its Anti-IED IOD proposal.

Curiously, in Oct 04 Ionatron proposed its Joint IED Neutralization (JIN) system. This occurred just four months after XADS proposed the same core concept to the government, and for which it was turned down. To the knowledge of the author of this case study and personnel from XADS who were contacted, Ionatron had not previously formally proposed this application of their ESD NLW technologies to the government, especially not before 16 Jul 04. On 14 Jan 05 Ionatron demonstrated its core JIN technology, and in Mar 05 received \$1.7M to produce a JIN prototype. Soon thereafter, possibly in Apr 05, Ionatron received a contract to produce 12 JIN systems for \$14 million then, possibly \$24M today.

Realizing that the ESD IOD concept was now, suddenly, being viewed favorably by the government, XADS was determined to propose IOD again. On 12 May 05 XADS re-submitted an updated version of its StunStrike IOD proposal that had been rejected in 2004, to Joint IED Defeat Organization (JIEDDO), also previously known as the Joint IED Task Force (JIEDTF). This renewed submission included supporting video clips showing the StunStrike IOD detonating explosives. On 9-21 Jul 05 XADS demonstrated all 3 of its StunStrike IOD systems detonating explosives, including the briefcase sized system. On 20-21 Jul 05 XADS' "Rifle" and "Tower" systems achieved 100% effectiveness against all IED targets presented by JIEDDO. In light of that demonstrated success, on 26 Jul 05, JIEDDO requested that XADS provide a quote for pricing on prototype and production units of StunStrike IOD systems integrated into remote-controlled vehicles.

However, on 27 Jul 05 the JIEDTF leadership questioned the JIEDTF staff on the wisdom of JIEDTF pursuing a similar ESD-based technology to that of the Ionatron JIN that was already funded. In response, on 1 Aug 05 XADS submitted full price proposals for both prototype and production units to answer both the leadership questions as well as the requested quote for pricing. When combined with the lower cost of XADS' system(s) compared to the JIN, the superiority of the XADS demonstrated in JIEDTF testing appeared compelling. It appeared to sufficiently answer the question of why StunStrike IOD should be developed concurrently, if only as a parallel path for risk reduction in ESD C-IED technologies.

The XADS IOD proposal compared favorably with other ESD alternatives. The price for a prototype program and non-recurring engineering costs was \$1.5 million. The costs per unit production, turn-key, delivered, with training, spare parts kits, and support was \$250k each, assuming the purchase of 10 systems. The total program cost proposed was \$4M for 10 IODs. This compares with \$15.7M for 12 JIN systems. In fact, on 10 Aug 05 in a quarterly earnings report conference call, Ionatron announced that it was additionally receiving \$10M for 90 days of support of 12 JIN systems in Iraq, bringing total program costs to \$24 million.

On 9 Nov 05 the JIEDTF approved \$2M for XADS to prototype the StunStrike IOD, and on 13 Feb 06 XADS received a \$1.28M contract to prototype the IOD, with the balance of the JIEDTF costs going to NSWCCD in Crane, IN where the IOD PM resided. On 30 Nov 06 XADS IOD delivered and successfully demonstrated and tested the capability at Camp Atterbury. On 20 Mar 07 to IOD project was approved for second phase, this time to build 4,

much more powerful, upgraded systems for operationally realistic testing at White sands Missile R (WSMR) and/or Yuma Proving Ground (YPG). It was not until after several months of delays, on 14 Aug 07 XADS was finally issued a contract for 4 systems (2 to be installed on a vehicle, plus 2 spares).

Meanwhile, Ionatron's revised JIN efforts were expedited, with government assistance. In Jul 07 JIEDDO issued a contract to Ionatron for JIN to be mounted on a mine roller, in response to the MNF-W JUONS titled as Directed Energy Standoff IED Neutralization System (DESINS). The author of this case study has heard that Ionatron re-purposed an existing, previously-delivered JIN unit to a mine-roller for this contract. In support of this re-purposing, which amounts to integration of Government Furnished Equipment (GFE), the company received a mine roller and an MTVR almost immediately, again both GFE. On 29 Oct 07 Ionatron's JIN/JOLLER system delivered to White Sands for testing.

On 1 Dec 07 NSWCCD and XADS commenced initial testing of the IOD system at Camp Atterbury. This was done in the absence of a GFE MTVR platform, the vehicle that had been expeditiously provided to Ionatron for JIN and roller integration in Jul 07. In spite of this limitation the IOD yielded favorable results. On 6 Dec 07 the MTVR platform was finally received at XADS' facility for IOD integration, and the following day integration began. Delivery and acceptance testing of the MTVR-integrated IOD at either Panama City, FL or Camp Atterbury is currently projected for 3 Mar 08, with subsequent testing at WSMR planned for the end of Mar 08.

XADS presented this proprietary concept to government personnel, including Mr. Carlton land, a JNLWD employee. XADS had been through a long process of proposals, design, development, testing, evaluation, and simple waiting to get to this point, and believed they had a solution which would serve the needs of our Armed Forces effectively and efficiently.

As an observer of the operational value of ESD technologies, and as the author of the Dual Effects Standoff IED Neutralization System (DESINS) JUONS and UUNS documents, the author understands the advantages of funding many like-technology approaches in parallel. This consistently leads to an acceleration and optimization of initial capabilities. Ionatron and XADS both have valuable experience in the area of ESD applications for military operations. It is true that Ionatron, by virtue of its pre-Oct 05 investments in LIPC directed ESD had a larger program in place, one that benefited from significant political support in Congress. From the standpoint of viewing Ionatron as an apparently sole-source technological opportunity in the CIED fight, the JIEDTF was well advised to invest in the "JIN" concept. Later we would discover that Ionatron was not a sole source in the realm of ESD expertise and creativity, and perhaps not the father of the basic IOD/JIN core concept. It was indeed good that XADS eventually got funded as well. But if XADS had been funded for the precisely same core concept on 24 Aug 04 by the DoN, all fielded CIED ESD capabilities today would be more mature and effective, because both concepts have shown merit.

However, the real crux of this discussion is the fact that the possibility exists that XADS' proprietary IOD concept may have been improperly delivered to a competitor by government personnel. Relating this to the CHPLD case study, this may represent another

iteration of a pattern of inappropriate information sharing that, as with the CHPLD, disadvantages a small yet creative “disruptive entrant” vendor in the face of more substantial industries having established habitual relationships with USMC combat developers, especially in the realm of NLWs. In this case the pattern is repeated at JNLWD, although, as with LRAD, dazzler, and MRAP it extends to other Quantico organizations as well. These patterns should receive closer inspection from the IGMC to either prove or disprove widely held, but still unsubstantiated, perceptions of impropriety. Without being cleared or corrected by such an IGMC look those organizations will not be viewed by industry as being above reproach.

4. Conclusions. The information relied on for formulating the conclusions below is limited to what could be reliably documented and was made available to the author for the chronology of events discussed above. There may be more information that either reinforces or contradicts the author’s conclusions below. Capturing and including such additional information can only be achieved if the scope of the total GCE study is expanded, the CHPLD Case Study is turned over to the IGMC, or a combination of both actions. In general, it can be concluded that flawed actions and willful inactions of combat developers regarding the GCE Advocate, II MEF (Fwd), and later the I MEF (Fwd) CHPLD UUNSSs, have created a significant adverse impact on the GCE’s ability to accomplish its mission. A detailed list of specific conclusions follows:

a. Overarching Conclusions

(1) It took Marine Corps combat developers 18 months to deliver to the GCE a COTS capability requested in an UUNS, when a delivery timeline of 90 days or less is expected for COTS items.

(2) The capability delivered to the GCE by combat developers was not the COTS CHPLD capability requested in the II MEF (Fwd) UUNS and repeated in I MEF (Fwd) UUNSSs, and is more hazardous and less effective than the CHPLD requested by the GCEs.

(3) The delay in the delivery of the urgently requested COTS capability has had measurable operational consequences, and has created a significant adverse impact on the ability of the GCEs to accomplish their missions.

(4) MCCDC, MCSC, JNLWD, NSWCCD G73, and the LSRB lacked technical and operational qualifications required to respond to the urgent needs for the CHPLD expressed by the GCEs of II MEF (Fwd) and later of I MEF (Fwd).

(5) Connections between personal, programmatic, institutional, and/or political interests of MCCDC, MCSC, JNLWD, NSWCCD G73, LSRB and others that led to the decision to field the GBD-IIIC and reject the CHPLD are worthy of IGMC consideration.

b. Technical Conclusions. Combat developers demonstrated a lack of technical competencies with regard to analyzing and acting on the GCEs’ requests for CHPLDs, specifically:

(1) MCCDC officials did not understand the nature of the II MEF (Fwd) need in their evident inability to comprehend the unique design characteristics of the CHPLD with respect to safety and effectiveness.

(2) MCCDC officials did not recognize why the GBD-IIIC might pose more serious eye hazards and provide lesser effects when compared to those of the CHPLD in their analyses.

(3) MCCDC officials did not accurately gauge the technical propriety of testing standards applied to the CHPLD by the NSWCDD G73 as they conducted their analysis.

(4) MCCDC officials endorsed MCSC assertions that LE Systems lacked a production capacity, when in fact the company did have such a capacity, and exhibited it in practice.

(5) JNLWD officials did not accurately gauge the technical impropriety of testing standards applied to the CHPLD by the NSWCDD G73 as they conducted their analysis.

(6) JNLWD officials did not recognize the inapplicability of conservative civil eye hazard standard-based dazzler policies to the military operational environment, and did not challenge that standard even after several I MEF (Fwd) UUNSSs required such challenges.

(7) NSWCDD G73 officials erroneously relied on “simplified” single point source calculations for the evaluation of a multi source CHPLD.

(8) NSWCDD G73 officials allowed simplified calculations to govern their 1st evaluation of the CHPLD, a report used to justify the prevention of the CHPLD’s appearance before the LSRB in 2006.

(9) NSWCDD G73 officials penalized the CHPLD as a “pulse” laser when in fact it was a gated beam modulation with a duty cycle near 70% that approximated “CW,” as verified in independent testing.

(10) NSWCDD G73 officials characterized the CHPLD as a Class IV laser, when in fact it was a Class IIIB device.

(11) LSRB officials endorsed NSWCDD G73’s characterization of the CHPLD as a Class IV laser, when in fact it was a Class IIIB device.

(12) LSRB officials endorsed NSWCDD G73’s reliance on single point source calculations for the testing and evaluation of the multi source CHPLD.

(13) LSRB officials endorsed NSWCDD G73’s penalization of the CHPLD as a pulse laser when in fact it was a gated beam modulation that approximated CW with a duty cycle near 70%, as verified in independent testing.

(14) LSRB officials suggested that “*permanent blindness*” will occur at all power densities above the MPE, when the MPE is in practice only 1/10 of the power density at which permanent blind spots are expected to occur in 50% of subjects.

(15) LSRB officials held the CHPLD’s Lithium batteries against the system’s operational suitability when those batteries had already been officially approved by NAVSEA.

c. Operational Conclusions. Combat developers demonstrated a lack of operational competencies with regard to analyzing and acting on the GCEs’ requests for CHPLDs, specifically:

(1) MCCDC officials permitted the fulfillment of an UUNS to extend to 18 months, when it is the right and the responsibility of operational commanders to balance the risks and opportunities of employing rapidly fielded items.

(2) MCCDC officials did not recognize the operational consequences of delay, and did not impose an operational sense of urgency on less operationally focused, process-driven organizations like the JNLWD and the LSRB.

(3) MCCDC officials chose to dismiss a report that SOCOM forces were safely and effectively employing CHPLD’s in Iraq, one that could have been employed as a justification to permit immediate employment of the 28 purchased by I MEF (Fwd).

(4) MCCDC officials did not recognize the operational utility of the closer NOHD, longer range daytime glare, and larger target spot size of the CHPLD.

(5) MCCDC officials did not recognize value of the redundancies built into multi source aperture arrays like that of the CHPLD from the perspective of operational reliability and availability.

(6) MCCDC officials did not recognize the operational advantages of Supply System controlled Lithium batteries of the CHPLD as a means of restricting the employment of dazzlers to U.S. forces.

(7) MCCDC officials hastily endorsed an LSRB rejection of the CHPLD, when the rejection was actually based on several flawed operational assumptions.

(8) NSWCDD G73 officials did not recognize that their imposition of a 10 second exposure standard on dazzlers was operationally baseless and harmful to Marines and innocents by greatly extending NOHDs.

(9) NSWCDD G73 officials did not recognize that their concerns with labeling, FDA exemptions, and other administrative checklist criteria was not shared by Marine operators possessing a chronic immediate need for the CHPLD capability.

(10) NSWCDD G73 officials lacked the operational qualifications to question the operator need for more dazzlers and/or dazzlers having different characteristics than those of the GBD-IIIC that G73 and the LSRB had already approved.

(11) LSRB officials did not recognize that their endorsement NSWCDD G73's 10 second exposure standard on dazzlers was operationally baseless and harmful to Marines and innocents by greatly extending NOHDs.

(12) LSRB officials did not recognize that their endorsement of NSWCDD G73's concerns with labeling, FDA exemptions, and other administrative checklist criteria was not shared by Marine operators in need of the CHPLD capability.

(13) NSWCDD G73 officials lacked the operational qualifications to concur with NSWCDD G73's questioning of the operator need for more dazzlers and/or dazzlers having different characteristics than those of the GBD-IIIC.

d. Conclusions Related to Professional Propriety. Combat developers did not remain above reproach with regards to decisions, actions and inactions related to the CHPLD, specifically:

(1) MCCDC officials recommended that the GBD-IIIC be purchased as a sole source in 2005, even in the face of contradictory AFRL test results.

(2) MCCDC officials recommended that the GBD-IIIC be purchased as a sole source in 2005, even in the absence of NSWCDD G73 testing of the CHPLD and before either device had gone before the LSRB.

(3) MCCDC and MCSC evidently stifled free and open competition in not insuring that the CHPLD was afforded the same timely NSWCDD testing and LSRB evaluation opportunities as the GBD-IIIC.

(4) MCCDC officials may have misrepresented the operator requests for dazzlers to the CDIB and the MROC by implying that the GBD-IIIC was II MEF (Fwd)'s original UUNS request and that interest in the CHPLD was limited to I MEF (Fwd).

(5) JNLWD, MCSC, and MCCDC officials misrepresented the CHPLD and its manufacturer in derogatory correspondence that was later disproved in both independent testing and exhibited manufacturing performance.

(6) JNLWD officials endorsed an earlier unqualified recommendation of MCCDC officials recommending that the GBD-IIIC be purchased as a sole source, even in the absence of an NSWCDD G73 evaluation of the CHPLD and before that device had been seen by the LSRB.

(7) JNLWD officials cut off communications with the LE Systems vendor on the legalistic grounds of protecting the program even while I MEF (Fwd) operators who remained in harm's way were urgently pulling on the CHPLD.

(8) As the “Responsible Authority” a JNLWD official repeatedly decided not to arrange for the provision of the NSWCCD G73 evaluation to LE Systems for prompt CHPLD corrective action.

(9) JNLWD officials exhibited willful blindness in overlooking GCE Advocate and I MEF (Fwd) suggestions that NSWCCD G73 could potentially have a conflict of interest in an evaluation of the CHPLD.

(10) MCCDC, MCWL, MCSC, and JNLWD officials did not act on 13 Sep 06 direction from DC, CDI to expedite corrections to the CHPLD, and expedite its presentation to the LSRB.

(11) NSWCCD G73 officials did not investigate individual beam divergence angle measurement inconsistencies between G73 test results and those of AFRL, when the narrow divergences alleged by G73 penalized the CHPLD.

(12) NSWCCD G73 officials did not recuse themselves from the second technical evaluation of the CHPLD, even after questions about the neutrality of the lab were raised, with prior flawed CHPLD testing and PM, NSWCCD G73 LSRB membership as evidence.

(13) NSWCCD G73 officials did not recuse themselves from the second technical evaluation of the CHPLD, even after prior decisions favorable to the GBD-IIIC and NSWCCD programmatic relationships to BE Meyers were possible evidence of a lack of neutrality.

(14) NSWCCD G73 officials reported in at least one 2007 press interview that they had not been approached by the Marine Corps to urgently evaluate the CHPLD for operational employment, when in fact they had been contacted by II MEF (Fwd) in 2005.

(15) LSRB, NSWCCD G73, JNLWD, and MCCDC officials considered only the II MEF (Fwd) Dazzler UUNS in the second evaluation and rejection of the CHPLD in 2007, even though those organizations were in possession of the I MEF (Fwd) CHPLD UUNS.

(16) LSRB officials exhibited approved the NSWCCD G73 for the second evaluation of the CHPLD even after questions had been raised about the lab’s neutrality by both the office of the GCE Advocate and I MEF (Fwd).

(17) LSRB officials permitted the CHPLD to be held to different technical standards than the GBD-IIIC, and yet declared the CHPLD comparatively more hazardous and less capable than the GBD-IIIC in formal LSRB judgment.

(18) LSRB officials permitted the fielded GBD-IIIC to continue to be employed in operations even though they had imposed a new 114 meter NOHD on the device based on a 10 second exposure.

(19) MCCDC officials provided incomplete information to DC, CDI as he prepared to sign a letter to LE Systems as a representative of the USMC position, in response to a letter that LE Systems had sent to CMC.

(20) MCCDC officials provided incomplete information to CMC as he prepared to sign letters to Sen. Biden and Sen. Bond providing the USMC position, responding to a previous letter of concern from the Senators to SECDEF.

(21) Since 2005 MCCDC, MCSC, JNLWD, NSWCCD G73, and the LSRB appear to have harbored a bias against the CHPLD, and one that favored the GBD-IIIC that reflect various degrees of lacking technical and operational competencies.

(22) MCCDC, MCSC, JNLWD, NSWCCD G73, and the LSRB maintain their biases even in the face of contravening information in an apparent collective effort to defend programmatic decisions and minimize the impacts of delays and consequences.

(23) While any certainty of individual improprieties remains undetermined, the existence of a corrupted combat development process is possible, and worthy of IGMC investigation.

e. Legal Conclusions. Gross mismanagement of the dazzler issue may have created a significant adverse impact on the GCE's ability to accomplish its mission, with measurable operational consequences. In light of this possibility, several Marine Corps Orders (MCOs) may be applicable:

(1) MCCDC, JNLWD, and MCSC officials may have acted in violation of MCO 3500.27B (Ref. o.1), Operational Risk Management (ORM). This MCO states in part: "ORM is an integral part of the decision making process for both Marine Corps military and civilian personnel in all operational and non-operational activities," and "The primary objective of ORM is to avoid unnecessary risk. Successful implementation of the ORM process will increase mission effectiveness while minimizing unnecessary loss of assets, both personnel and materiel."

(2) MCCDC, JNLWD, and MCSC officials may have acted in violation of MCO 5100.8 (Ref. o.2), Marine Corps Occupational Safety and Health (OSH) Policy. This MCO states in part: "Commanders/commanding officers shall implement this Order...This Order promulgates Marine Corps Occupational Safety and Health (OSH) policy to eliminate or minimize the probability of mishaps occurring in training, industrial, U.S. Government and tactical vehicle, other operational, and off-duty environments..."

(3) MCCDC, JNLWD, and MCSC officials may have acted in violation of MCO 5100.29A (Ref. o.3), Marine Corps Safety Program. This MCO states in part: "Commanders at all levels are responsible for ensuring that the Marine Corps Total Force is maintained at the highest level of readiness possible by incorporating operational risk management (ORM) in all operations assuring controls are in place for any hazard that cannot be eliminated and providing appropriate safe and healthful facilities for all their personnel," and "This order is applicable to all Marine Corps personnel, to include...military personnel and civilian Marines," and "This

order applies to all Marine Corps facilities, equipment, training facilities, and materiel; and is in effect ashore, on or off Marine Corps installations, or while embarked in aircraft of vessels.”

(4) MCCDC, JNLWD, and MCSC officials may have acted in violation of MCO 7510.5A (Ref. o.4), Marine Corps Fraud, Waste, and Abuse (FWA) Oversight, Awareness, Prevention and Remedies. This MCO states in part: “The Marine Corps is committed to an aggressive program of oversight, awareness, prevention, and remedies of FWA. Our goal is to preclude even the slightest impression of impropriety in the handling of our manpower, material, and money,” and Commanding Generals are responsible for “Requiring economy within their commands and strict compliance with regulations governing the receipt, accounting and expenditure of manpower, money and materials.”

(5) MCCDC, JNLWD, and MCSC officials may have acted in violation of MCO 5800.13A (Ref. o.5), Investigations of Allegations Against Senior Officials. The fact that these acts occurred at least in part due to priorities connected to pre-ordained programmatic paths and rigid process conformance for its own sake, and the fact that General Officer decision makers were impacted, may also make MCO 5800.13A applicable here.

f. Final Conclusions. The CHPLD case study demonstrates:

- (1) A lack of transparency in USMC combat development.
- (2) A lack of personal accountability in USMC combat development.
- (3) A lack of balance in the competencies of USMC combat developers.
- (4) The needs of operators were different than the interests of developers.
- (5) When operator needs oppose developer interests, developers prevail.

5. Recommendations

a. Immediate USMC change recommendations

(1) That DC, PP&O provide this case study to the Inspector General of the Marine Corps (IGMC) for consideration so that appropriate lessons learned can be gathered.

(2) That CMC correct the record with the U.S. Senators who received the CMC letter as well as public statements, should IGMC conclude that relevant specifics of this study are correct.

(3) That DC, PP&O approve the expansion of the scope of the GCE study to include several more recent case studies and the formulation of comprehensive combat development recommendations.

(4) That DC, PP&O approve the hiring of a qualified Contractor to assist with the execution of an expanded GCE Advocate study and to participate in the writing of the new UUNS MCO under the lead of MCCDC.

(5) That USMC model a “Ground Tactical Vehicle Fleet (GTVF)” on the USMC Aviation community and its professional standards.

(6) That USMC institutionalize the tactical vehicle Base Line Survivability Index (BLSI) based on the Aviation community safety program.

(7) That USMC introduce deliberate risk management to the GTVF.

(8) That CMC assign DC, PP&O as the Marine Corps GTVF Advocate.

(9) That USMC instill the same sense of occupational professionalism into GTVF operators as exists in the naval Aviation community today.

(10) That DC, PP&O, as the GTVF Advocate model GTVF safety manuals and procedures on the Aviation NATOPS.

(11) That USMC enforce rapid acquisition practices for urgent needs signed in-theater by requiring that an operationally current BGen to preside over every meeting of the CDIB, and that this critical meeting presence cannot be delegated.

(12) Insure that all urgent needs are logged at the JRAC and the Service HQ for visibility while still undergoing analysis below.

(13) Enforce deadlines on MCCDC analysis processes - measured in days, not weeks and months, and hold individuals accountable.

(14) Enforce rigorous reporting on the status of submitted needs – hold individuals accountable.

(15) That DC, CDI insure that the perspective of the operational command forward should dominate the CDIB voting influence over urgent needs, with 51(+)% of influence in the outcome of any CDIB decision on any need submitted from in-theater.

(16) Extend 51(+)% warfighter voting influence to all urgent needs submitted by predecessor MEF (Fwd)s.

(17) Extend 51(+)% warfighter voting influence to authorize the cutting off of all further analysis, testing, etc. if such activities slow fulfillment, and the warfighter is prepared to accept the risk.

(18) Require a mix of graduate-level physics, engineering, and CS MS qualified civilians as voting CDIB members – USMC experience is desired, but not required.

(19) Require a mix of Naval Postgraduate School MS qualified physics, engineering, and CS MS qualified in physics, engineering and CS uniformed CDIB members.

(20) Pay government civilians competitively compared to industry counterparts to attract competent physics, CS, and engineering credentials on the CDIB and at MCWL.

(21) Change civilian job descriptions to attract deployable technologists who value the warfighter sense of urgency.

(22) Require key civilians to regularly deploy with operational units for a minimum of six month tours, consistent with deployment rhythm.

(23) Terminate transient MCCDC LNOs in the MEFs; rather require full-length tour assignments of MCCDC personnel with MEF HQ rotations

(24) Reduce the civilian headcount at MCCDC to minimize management by committee, such as within the CDD.

(25) That DC, PP&O approve the hiring of a qualified Contractor to assist with the execution of an expanded GCE Advocate study and to participate in the writing of the new UUNS MCO under the lead of MCCDC.

b. Concurrent DoD change recommendations

(1) Eliminate all Service-specific needs statements, i.e. UNS, UUNS, ONS, etc.

(2) Create a Joint needs submission form using the JUONs as the template.

(3) Expand functions of the JRAC to receive all Service and COCOM needs, including S&T-related initiatives, to rapidly analyze and assign to appropriate USG developers or SYSCOMs as executors, and develop a funding strategy to speed solutions and eliminate unintended duplication of effort.

c. Proposed supporting legislation

(1) Empower warfighting generals to make some larger COTS purchases on their own authority for speed.

(2) Permit commanders to balance enemy threats against system maturity, testing, cost, etc., instead of CONUS officials.

Raise funding cap on warfighter procurement from \$250k per system (currently) to \$1M or more per system.

(3) In conjunction with an increase in discretionary warfighter spending authority, authorize corresponding rapid prototyping and operational experimentation in-theater.

Note: The technical expertise within the MEF (Fwd) CE, Seabee, Communications, and Engineer units is consistently high. Given this in-house expertise the MEF (Fwd)s have created 'Monster Garage' concepts that provide in-theater developmental capabilities for the limited scale production of some urgently needed capabilities. There have been many documented material successes, including but not limited to mine rollers, G-BOSS ISR IOC, and TCVS power-life extension improvements. This should be institutionalized and provided significant resources under control of the warfighter, including S&T.