



The Directed Energy Battlefield: Obstacles to Success Synopsis and Key Insights



Key Insights and Recommendations

- Military applications such as ballistic/cruise missile defense and non-lethal warfare remain urgent, enduring, strategic priorities for the U.S. Although 40 years have passed since the initiation of DEW programs, DEW still offers unique capabilities against these priorities.
- The DEW S&T community must work to overcome its undemonstrated promise.
- The DE community needs to field systems that will help demystify the new technology. Lower power systems for counter-sensors and non-lethal weapons are suitable for early operational evaluation.
- DE weapons require a coordinated, dedicated, and long-term strategic communications plan to facilitate the introduction of anti-personnel weapons.
- The barriers preventing deploying new DE devices are not legal, treaty or policy; they are technology and system complexity, cost, lack of a “business” and operational case, and perception issues.
- Due to significant skepticism surrounding DEW, a senior military/DoD “champion” is needed to move technology to deployment.

Introduction

Over the course of two days, roughly one hundred representatives from OSD, DoJ, DoE, the military services, DoD laboratories, private industry, and think tanks gathered at a National Defense University forum to engage in a frank examination of the status of Directed Energy Weapons research. During that wide-ranging discussion, participants identified key challenges to the DE community and outlined a series of capability, credibility, and cultural, gaps which obstructed policy success.

Capability Gaps

There was a general perception among attendees that the U.S. needs to move from DE research to fielding real-world applications that build a library of operational experience. This implies the DE community must take stock of the technical maturity of laser and microwave programs, many of which are still at least a dozen years from completion such as high power solid state and free electron lasers.

Several speakers argued that international trends in R&D indicate the U.S. could quickly fall behind other states attempting to operationalize DE technology, particularly in the area of anti-personnel weapons. This scenario would deny American forces the ability to dominate key disruptive technologies and risked placing in jeopardy a whole generation of underequipped U.S. war fighters. According to one legal expert, “The lesson is that if you come up with something new, you will face allegations of illegality while others quietly develop the same programs.”

Participants agreed that to keep enthusiasm for DE programs alive, DDRE should re-direct its efforts to lower power, solid state systems which show the potential for shorter-term results. The termination of many high-profile programs during the past 5 years has come as a shock to many in the DE community and sharpened the desire, as one speaker said, “to quit talking about the potential of Directed Energy and begin to field systems.” A debate emerged about how this might best be accomplished.

Some attendees argued policy-makers would only embrace Directed Energy after being presented with a complete, deployable weapon system. Once the benefits of DE devices became tangible, these participants argued, operators would begin demanding the new technology. Policy-makers would also be more responsive when presented with a complete system.

Other attendees appeared to disagree with a principle they called, ‘build it and they will come.’ Philosophically, they preferred a more focused approach, and highly prioritized non-lethal DE programs according to their relevance to U.S. “capability gaps.” These U.S. deficiencies underscored the need for insurgency and occupation style operations, such as stopping or disabling a moving vehicle, and dissuading or immobilizing individuals.

Credibility Gaps

The DE community faces a credibility gap. After more than 40 years of investment, its research has yielded no deployed systems.. As a result, support for ground-breaking new DEW technologies has withered. The failure to translate laboratory gains to the battlefield has also exacerbated normal resistance to innovation in conventional weapons and policy-making communities. Participants defined several possible strategies for restoring enthusiasm for Directed Energy programs.

- **Need for a Senior DoD Champion**
Attendees overwhelmingly agreed the community required the high-level advocacy of a senior DoD official “willing to put their career on the line to make this happen.” According to one industry expert, “We need to find the DE ‘Billy Mitchell.’” It’s unclear what might win such an endorsement, but participants believed DE program managers could begin by designing persuasive investment roadmaps for the future.
- **Define “Business Case” Potential**
Ultra-precision energy weapons may have several advantages over their kinetic counterparts when it comes to price. While it seems likely DEW benefit from a cheaper “cost per round fired” and possess deeper ammunition magazines, the real savings may come from the low level of collateral damage they inflict on their targets. Ultra-precision weapons, consequently, have enormous potential for use in counter-insurgency operations where U.S. forces are battling for the ‘hearts and minds’ of a population. The reduced cost argument is speculative, however. As several of speakers pointed out, the over-all price of deploying DE devices- with their attendant maintenance crews, logistical trains, electrical requirements, and lifetime costs - remains unknown.
- **Encourage Market Savvy Program Managers**
The S&T community has poorly advocated its work to potential transitioning sponsors. Several speakers spoke about the importance of educating program managers to the benefits of networking. “A successful non-lethal Directed Energy Program must have a program manager who works to ensure all the elements (Congressional outreach, Public Affairs Coordination, and Policy Review staff work) are adequately addressed, throughout the development process.”
- **Establish Testing Metrics**
The S&T world has established few scientific ‘metrics’ for testing their products realistically in the field. Demonstrations have concentrated on output as a performance measure while paying less attention to the needs of the war fighter, such as mobility, volume, and logistics. Ambiguity about the final product has frustrated industrial investment and prolonged the acquisition cycle. As one industry representative said, “We need to stop living in the S&T world. Scientists are some of the biggest barriers for enabling fielded DE systems. We need to find someone- anyone, in any agency- to be the first real world trigger puller...”
- **Lower Expectations, Smaller Devices**
Attendees agreed one of the principal obstacles to fielding Directed Energy Weapons was the lack of current high level interest due to a history of unfulfilled technological promises. The American involvement in Iraq and recent transformations in the military have created change in the center of gravity for the potential utility of DEW. Commanders have largely begun de-emphasizing the importance of high power weapons to destroy enemy weapons platforms. They

emphasize, instead, a need for lower power applications, such as sensor and electronics destruction/denial and less than lethal anti-personnel applications.

Cultural Gaps for anti-personnel non-lethal weapons

The development of DEW for anti-personnel including non-lethal weapons has been an area of research traditionally surrounded by public skepticism, fear, and distrust. Part of the *problem of perception* has been based on weapons designed- as some have imagined- to set targets alight, sterilize personnel or dramatically blind subjects en masse. Such misinformation often feeds public fears domestically and incites conspiratorial rumors abroad which risk damaging the reputation of the U.S. as a forthright international actor. Nevertheless, the claims serve as a persistent warning to policy-makers and a distraction for DE advocates.

Attendees agreed the danger of a possible “CNN effect” was a formidable threat to the future of DE non-lethal technological development. Our audience recommended without reservation that DE devices be deployed in concert with a robust strategic communications plan.

Participants also agreed that among the technologies our conference considered, the Active Denial System appeared to possess the potential to shatter cultural barriers which have stigmatized DE as “death ray” technology. Deemed safe and effective in extensive preliminary testing, with a scalable level of intensity, and possessing a range exceeding other non-lethal alternatives, conference participants were optimistic that ADS is capable of altering public perceptions about the use of energy weapons against human targets. ADS has also exhibited a number of operational advantages not shared by larger, more exotic DE systems, for instance; portability, light logistics train, relative simplicity, and ability to be mounted on conventional weapons platforms.

The audience was optimistic ADS technology would follow the cultural template of other non-lethal devices which, after initial resistance, gained widespread social acceptance. A prominent example of such a movement was Taser technology, first introduced to law enforcement over a decade ago. One industry representative explained that Taser’s widespread adoption was the result of a conscious, pre-determined marketing strategy employing:

- **A public education campaign** advertising the product’s limits and uses
- **High-level endorsements** from subject experts with an established reputation among operators and a network among the targeted community of users.
- **Training regime** which emphasized safety and transparency.
- **Exhaustive scientific testing** which measured results against alternative systems in a realistic, measurable fashion.
- **Targeted demonstrations** which introduced the product to commanders and operators

- **Dedicated customer relations** team which aggressively confronted false claims about the equipment's perceived deficiencies.

Sum: 'Policy success is based on credibility, legitimacy, acceptance and affordability.'

Our conference devoted significant time to weighing the benefits and liabilities of producing an ADS product for U.S. law and border enforcement agencies. One distinguished DOJ participant broadly outlined a strategy for marketing DE technology to roughly 21,000 state and local agencies.

However, unlike Tasers, the ethical and legal implications of DE technology remain largely undefined. There exists a misperception among mid-level policymakers that DEW risk violating existing international treaties and domestic laws. Several participants suggested these fears could be alleviated by, "getting lawyers involved early (in the requisition process)." Others argued DE devices might themselves be designed to accommodate legal considerations. Some examples of this could include options like 'dialed' intensity level, focus, or beam visibility.

Throughout the conference, participants persistently expressed faith in the value of producing a "breakout" DE system. Success in the field of non-lethal DE weapons was viewed as an especially helpful development. Many believed that like the Taser, ADS holds the potential to familiarize the public to an innovative new technology while lending momentum to related programs.

Conclusions

DE advocates struggle with obstinate uncertainties which undermine their effectiveness. Cultural gaps re-enforce widespread misperceptions about the purpose, operational limits, and legal restrictions related to non-lethal DE weapons. Credibility issues surround high power DEW programs which, in the past, may have been "overhyped" and seem to offer no realistic investment strategy for the future. Finally, there exists a dearth of knowledge about the operational effectiveness of some proposed DE devices. This has made operators, policy-makers, and defense contractors wary of supporting programs which remain experimental.