

## At a Glance

### What is it?

- ONR's Counter-Directed Energy Weapons (CDEW) Program explores innovative research and solutions aimed at delivering a new means for adapting to, defending against, and negating the effects of hostile high-energy lasers, high-power microwaves, and other directed energy weapons in the maritime domain.

### How does it work?

- Lasers and high-power microwaves transmit energy through the electromagnetic spectrum, and the energy being deposited in the illuminated object causes it to heat up, melt, or burn.
- CDEW efforts possess the potential to dissipate, defocus, or reflect energy, resulting in reduced damage to the target.
- This would neutralize the damaging effects of a directed energy weapon when fired against U.S. forces on the battlefield.

### What will it accomplish?

- The CDEW Program will investigate the intersection between directed energy, materials, optics, and physics.

### Point of Contact

Dr. Lewis DeSandre, ONR Code 351  
desandl@onr.navy.mil



The Office of Naval Research (ONR), together with the Naval Postgraduate School, the U.S. Naval Academy, the Naval Research Laboratory, and naval air, space and surface warfare centers are investigating basic research topics related to countering the threats that come from directed energy weapons systems, such as high-energy lasers or high-power microwaves.

ONR has started basic research efforts with potential airborne, surface, ground and underwater applications that would provide operational effectiveness against various known and projected weapon systems. In the coming years, efforts will continue to expand in the commercial, university, and academic environments to broaden the scope of CDEW research topics and understanding. The basic research tenet of CDEW strives to understand how energy transmission and conversion inefficiencies can be exploited as a countering technique.

Funding has already been provided to examine innovative technologies, techniques and tactics. This research examines both material and nonmaterial solutions, and their implications when related to the nullification of various directed energy weapon concepts. Current studies include the modeling of effects to address concerns for human safety as well as total systems integration with existing naval platforms.

Specifically, high-energy lasers can be used in maritime operations under various ship-to-ship engagements, but their utility may be limited due to atmospheric conditions. Typical ranges for most lasers are known to have their effectiveness limited due to high-clutter environments and the optical effects of water in the air caused by sea spray. ONR is pursuing a new understanding that will address the complexities of fighting at sea in an already complex naval warfighting construct.

Some aspects of the CDEW research can have potential civilian applications, such as laser eye protection.

### Research Challenges and Opportunities:

- Laser and high-power microwave-hardened materials
- Directed energy weapons modeling and simulation
- Atmospheric and turbulence-induced scattering of lasers
- Chaos theory and predictive methods of electronic circuit failure

