



**Directed Energy Professional Society (DEPS)
Annual Directed Energy Science and Technology Symposium
22-26 March 2021 – Virtual Symposium**



Directed Energy Intermediate Force Capabilities

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23 MAR 2021; 09:30-10:00a

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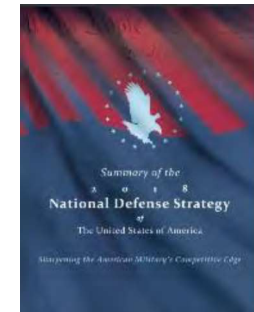


Strategic Relevance of IFCs



- **National Defense Strategy (NDS)**

- *“Be strategically predictable, but operationally unpredictable – our dynamic force deployment, military posture, and operations must introduce unpredictability to adversary decision-makers” (pg. 5)*
- *“Strengthen Alliances and Attract New Partners - By working together with allies and partners we amass the greatest possible strength for the long-term” (pg. 8)*



- **NDS Irregular Warfare Annex**

- *“The Department will embrace IW as an enduring and fundamental form of warfare” (pg. 6)*
- *“We will seize the initiative and execute proactive, enduring campaigns employing IW capabilities to expand the competitive space, shape the environment, and prepare for escalation to conflict, if required” (pg. 7)*



- **Tri-Service Maritime Strategy – “Advantage at Sea”**

“Intermediate force capabilities will provide options short of lethal force to contest coercive actions in day-to-day competition” (pg. 23)





Utility of Intermediate Force Capabilities Across Warfare Spectrum



“Gray Zone” competition dominates any conceptual Spectrum of Warfare and is ideally suited for Intermediate Force Capabilities



Phases of Warfare



Competition Continuum

IFCs are a ***strategic risk mitigation investment*** that provide warfighters tools to seize the initiative while competing below the level of armed conflict.



Intermediate Force Capabilities in Information Space



IFCs are a ***strategic risk mitigation investment*** that provide our warfighters the tools to compete below the level of armed conflict without losing credibility in the ***information space***.



Examples of DE IFC Technologies



Millimeter Wave Active Denial System (Tube-Based)



*Current Form Factor
(Two systems exist)*

Millimeter Wave Active Denial System (Solid-State)



*Future Form Factor
USA – Focused Assessment
(Projected 1st QTR 2021)*

High Power Microwave Vessel Stopper



*USCG Directed Energy Vessel Stopper
Afloat Military Utility Assessment*

High Power Microwave Vehicle Stopper

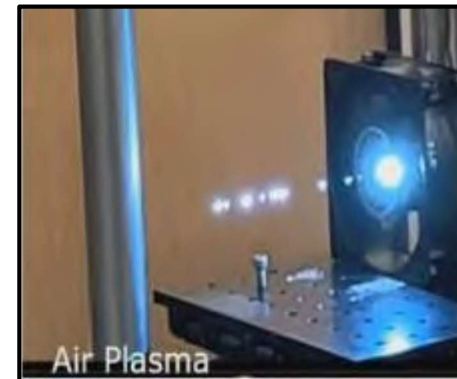


Prototypes under development

Long-Range IFC Payloads (DE & Non-DE)



Laser-Induced Plasma



*Audio / Physical / Thermal
Effects at Extended Range*



“Fear-of-the-New” and “First-Use” of Directed Energy Intermediate Force Capability (IFC) Weapons Study



- Directed Energy and Non-Lethal Weapons Community of Interest (DE & NLW COI), with support from OSD (R&E), requested a study in FY21/22 via a DE federally funded research and development center
- A “Directed Energy Intermediate Force Capability (DE IFC) ‘Fear-of-the-New’ and ‘First-Use’ of DE IFC Weapons” study will:
 - Make recommendations to the DoD on how best to make progress against the 2007 Defense Science Board Task Force on Directed Energy Weapons’ recommendation to develop a DoD DEW Strategic Information/Communication “Campaign” Plan that:
 - ✓ Counters the DEW “Death-Ray” myth
 - ✓ Thwarts the “Fear-of-the-New” for DEWs
 - ✓ Compels senior DoD leadership and the U.S. public to demand “First-Use” of non-lethal – low collateral damage DEWs



DE IFC Vignette: South China Sea



EXPEDITIONARY ADVANCED BASED OPERATIONS (EABO):

- U.S. Marines conduct bilateral training with Philippine forces
- Exercise conducted in contentious regions of the South West Pacific
- Chinese government expresses displeasure at exercise
- **Mixed fleet of armed Chinese Coast Guard and civilian fishing vessels attempt to disrupt the exercise**



Long Range Dazzling Laser producing glare on vessel wheelhouse

DE INTERMEDIATE FORCE CAPABILITIES (DE IFC):

- **Dazzling Lasers and Focused Acoustics** from both afloat and ashore forces employed to provide long range hail and warn to Chinese vessel operators impeding safe operations (1st form of escalation of force)
- **Active Denial Technologies (ADT) counter-personnel** employed to deter aggressive actions of Chinese fishing vessels around the island
- Long range (multi-km) **Non-Lethal Laser Induced Plasma Effects (NL LIPE)** employed to provide unambiguous hail and warn and suppressing effects to deter aggressive actions
- **Directed Energy Vessel Stopper** - High Power Microwaves affect the operational performance of outboard motors
- **DE IFCs** employed against small unmanned aerial systems creating safety of flight issues to U.S. aircraft



Active Denial System (ADS)

OPERATIONAL IMPACT:

- Boost versatility and adaptability across the Competition Continuum
- Expand decision time and space in ambiguous situations
- Build partner capacity with low-risk tools and Increase costs to competitors
- Support proactive operations while reducing risk in information space



RF Vessel Stopper





DE IFC Vignette: Wet Gap Crossing



SCENARIO: WET GAP CROSSING



- European Theater of Operations – Competition Below Armed Conflict
- HBCT mission requires wet gap crossing due to weakened bridge infrastructure by “little green men”
- Thousands of civilian refugees fearing open hostilities seek food, medical care, and safety
- S-UAV are regularly employed by state and non-state actors to observe and harass operations
- The HBCT commander faces the challenge of maintaining tempo without alienating the local population

DE INTERMEDIATE FORCE CAPABILITIES (DE IFC):



- Soldiers order the crowd to stay away from bridging operations using an **Acoustic Hailing Device (AHD)** in local dialects
- Some attempt to approach the bridge as the final sections are moved into position completing the span. Repeated attempts to stop them with voice commands fail
- Soldiers engage non-compliant individuals with the **Active Denial System (ADS)** to deter their action. ADS creates a brief intolerable heating sensation on targets, stopping their attempt to breach the perimeter
- UAS with an unknown payload is detected approaching the bridging operation.
- **ADS** engages the UAS, bringing it down a safe distance from the bridge
- Unknown civilian vehicle approaches the bridge
- Soldiers warn the driver with their **Common Remotely Operated Weapon Station (CROWS)-mounted dazzling laser** and **AHD**
- When vehicle fails to stop, Soldiers engage with **vehicle-mounted RF Vehicle Stopper**. The RF Vehicle Stopper transmits a high-power radio frequency beam that neutralizes and stops the vehicle’s engine



OPERATIONAL IMPACT:

IFCs improve Joint Forces ability to maintain effective OPSTEMPO during competition below armed conflict by:

- Enabling proportionate and discriminate use of force
- Reduce Risk of Unnecessary Escalation
- Addressing unpredictable and ambiguous threats
- Minimizing civilian casualties and collateral damage
- Building Partner Capacity
- Increasing the competitive space

EMERGING IFCs featured: ADS (Counter-UAS); RFVS; CROWS
CURRENT IFCs featured: AHD; ADS (Counter-Personnel);





DE IFC Vignette: Strait of Hormuz



MARITIME SECURITY OPERATIONS

- Carrier Strike Group in 5th Fleet AOR is conducting maritime security operations in the Strait of Hormuz
- A small vessel with an outboard motor and open cockpit is on a collision course with USS CVN
- Vessel is not responding to bridge to bridge communications nor internationally recognized sound and light signals
- Vessel is considered a contact of interest and is prevented from reaching the carrier through a layered defense of intermediate force capabilities



Active Denial System



Directed energy vessel stopper



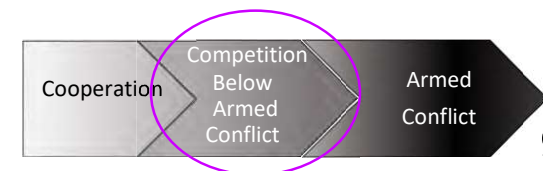
Occlusion technology

INTERMEDIATE FORCE CAPABILITIES:

- **Active Denial System** – Millimeter wave directed energy creates intolerable heating sensation forcing vessel operators to alter course
- **Occlusion** – Slows or stops a vessel by utilizing a material to reduce propeller efficiency
- **Directed Energy Vessel Stopper** - High Power Microwaves effect the operational performance of outboard motors

OPERATIONAL IMPACT:

- Boost versatility and adaptability across the Competition Continuum
- Expand decision time and space in ambiguous situations
- Increase costs to competitors
- Support proactive operations while reducing risk in information space





DE IFC Vignette: Urban Operations



MANEUVER TO OBJECTIVE:

- Coalition forces fighting insurgents in megacity
- Joint Forces must maneuver through urban areas to reach objectives and conduct daily resupply
- Noncombatants number in the tens of thousands and attempt to lead normal lives despite constant bloodshed
- Civilian vehicle and foot traffic impede movement of friendly forces



EoF CROWS

DE INTERMEDIATE FORCE CAPABILITIES (DE IFC):

- **Dazzling Laser and Acoustic Hailing Device** mounted on **EoF Common Remotely Operated Weapon Station (CROWS)** warns pedestrians/vehicle operators to give way
- Long range (multi-km) **Non-Lethal Laser Induced Plasma Effects (NL LIPE)** employed to provide unambiguous hail and warn and suppressing effects for crowd control and to deter aggressive actions
- **Vehicle Mounted Solid-State Active Denial Technology (SS-ADT)** clears roads of non-compliant individuals
- **Vehicle Mounted Radio Frequency Vehicle Stopper** protects friendly forces from suicide vehicle-borne improvised explosive devices and provides anti-access/area denial from threat vehicles rapidly approaching entry control points and our maneuvering forces
- **DE IFCs** employed against small unmanned systems approaching our dismounted forces



Solid-State Active Denial Technology



RF Vehicle Stopper

OPERATIONAL IMPACT:

- Help to prevent unnecessary destruction and loss of life
- Expand decision time and space in ambiguous situations
- Support proactive operations while reducing risk in information space



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SUMMARY



- We have changed the conversation to Intermediate Force Capabilities (IFCs)
- IFCs enable the warfighter to compete across the competition continuum without losing in the information space
- Ultimate goal of IFCs is mission accomplishment without unnecessary destruction that initiates or prolongs expensive hostilities
- Must overcome the “Fear-of-the-New”



U.S. embassy under attack in Baghdad



U.S. Navy ships transit the Strait of Hormuz





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Back-Up Slides



Background



- DoD Non-Lethal Weapons Program created in 1996 out of impetus from Gen Zinni and his experiences in Somalia during Operation Restore Hope
- National Defense Authorization Act directed DoD to centralize development of NLWs.
- CMC designated as the DoD NLW Program Executive Agent; Joint Non-Lethal Weapons Directorate established at Marine Corps Base Quantico
- Program has achieved many accomplishments with regard to advanced technology development and adoption of some capabilities into the Services
- Over time, the Services have vectored their involvement in the program to policing and security force communities for advocacy and resourcing
- Technology research under the auspices of the DoD NLW Executive Agent is leading to new capabilities with broader applications beyond law enforcement

We have changed the conversation to **Intermediate Force Capabilities (IFCs)** to engender meaningful conversation with broader community bases within the Services.



Investment Disparity of IFC Despite Strategic Utility



Investments in IFC do not come at the expense of lethality to the overall force

Suitability of Intermediate Force Capabilities



Suitability of Lethal Capabilities (Other than Deterrence)



If the Services accept the term “enhanced lethality” as the **sole** attribute that informs requirements and acquisition decisions, their ability to equip relevant combat forces today and tomorrow will greatly suffer.





IFCs Provide Effects Without Destruction



- Mission accomplishment without undesired casualties and destruction of critical infrastructure
- IFC implementation involves more than materiel, it is a new way of thinking about operational problems and crosses DOTMLPF
- Must change operational mindset so that Services incorporate IFCs into regular training and planning cycles
- With the proper tools and training, our warfighters will be unbeatable across the competition continuum, not just in the “Dominate” phase

VISION: Transform the National Security Enterprise by mainstreaming the planning and employment of Intermediate Force Capabilities to arm the Joint Force with the fullest range of capabilities in support of National Security objectives.



UNCLASSIFIED

Current vs. Advanced Technology IFC Initiatives/Concepts



Current Capabilities

Flashbang Stun Grenades



40mm Munitions (Blunt Impact, Flashbang, RCAs)



Stingball Grenade



12 Gauge Munitions

(Blunt Impact, Flashbang, RCAs)



Spike Strips



Acoustic Hailers



Tethered TASER (Short Range)



Human Effects Risk Characterization



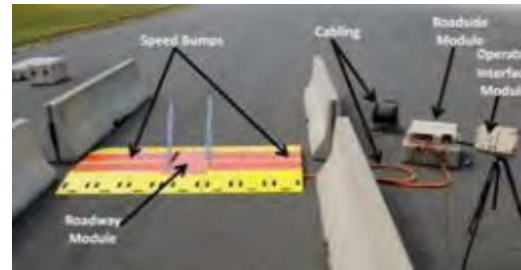
Next Generation Capabilities

Escalation of Force CROWS Concept for IFC Kit (Projected Demo - FY23)



Non-Lethal Directed Energy Weapon - Size, Weight, Power consumption, thermal Cooling, and Cost reductions (SWAP/C²)

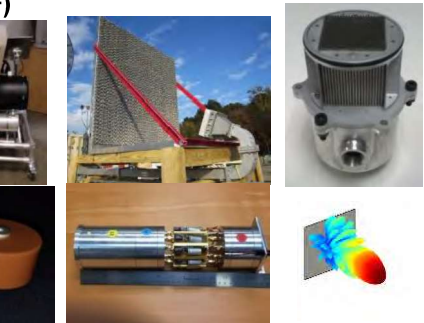
Pre-Emplaced Electrical Vehicle Stopper (Ongoing Pilot Program)



Dazzling Lasers (Long Range) Occlusion Technology



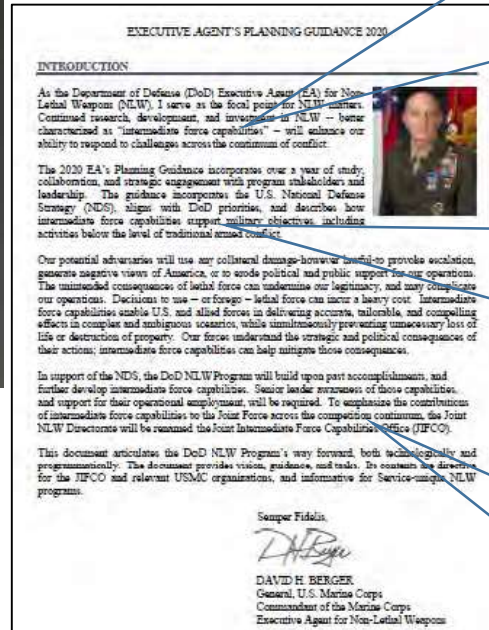
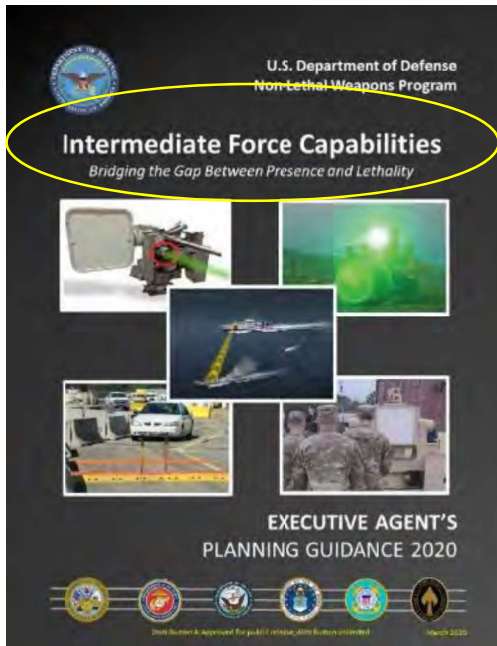
Remotely Deployed Vehicle Stopping Nets



Tether-less Human Electro-Muscular Incapacitation (HEMI) Munitions



DoD Non-Lethal Weapons (NLW) Program Executive Agent Planning Guidance March 2020



“Continued research, development, and investment in NLW – better characterized as **“intermediate force capabilities”** – will enhance our ability to respond to challenges across the continuum of conflict.”

“This guidance incorporates the U.S. National Defense Strategy, aligns with DoD priorities, and describes how intermediate force capabilities support military objectives, including activities below the level of traditional armed conflict.”

“To emphasize the contributions of intermediate force capabilities to the Joint Force ... the Joint NLW Directorate will be renamed the Joint Intermediate Force Capabilities Office.”