

**Three Distinct Areas of Homeland Defense:**

**Using Non-Lethal Weapons for Homeland Defense,  
Protecting U.S. Ports from Blockship Attacks, and  
“Mines in the Sky” for Conventional Missile Defense**

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# Today's Presentation Covers Three Distinct Areas

- Using non-lethal weapons for homeland defense
- Protecting U.S. ports from blockship attacks
  - Blockship attack: sinking a vessel to close a key channel
- Using “mines in the sky” for conventional missile defense

## Bottom Line Up Front

- Existing and emerging non-lethal weapons could be useful in homeland defense contexts
  - Such as confrontations near Alaska or against threats to HA/DR in CONUS
- An adversary could use blockship attacks to close critical U.S. waterways
  - Ways of countering this threat include:
    - ISR and environmental characterization
    - Authorization to use lethal and non-lethal weapons
    - Ensuring adequate underwater demolition/salvage capabilities and capacity to rapidly clear blockships
      - Including training and exercises that include numerous U.S. and allied participants
- UASs containing hard, sharp shards could create low-cost “minefields in the sky” to contribute to conventional missile defense
  - This concept should be further evaluated

# Non-Lethal Weapons Can Be Useful in CONUS

- Non-lethal weapons include diverse types of systems to warn, confuse, immobilize, incapacitate, and otherwise affect other parties
  - They are particularly useful in standoffs in the “gray zone,” in ambiguous situations, and around civilians
- In a recent report, we described 13 scenarios involving non-lethal weapons, including several that could be relevant in a homeland defense context
  - Aerial and maritime gray-zone confrontations
  - Countering domestic adversaries

## ***‘Are We Getting Invaded?’ U.S. Boats Faced Russian Aggression Near Alaska***

Russia has escalated its provocative encounters in the North Pacific this year, harassing boats in U.S. fishing waters and sending bombers toward Alaska’s shores.

*The New York Times*, 12 Nov 2020

## **Spike in Russian aircraft intercepts straining Air Force crews in Alaska, three-star says**

By Rachel S. Cohen

Apr 28, 2021



*Air Force Times*, 28 Apr 2021

*RAND has been conducting a series of studies on non-lethal weapons*



Research Report

KRISTA ROMITA GROCHOLSKI, SCOTT SAVITZ, JONATHAN P. WONG, SYDNEY LITTERER, RAZA KHAN, MONIKA COOPER

## How to Effectively Assess the Impact of Non-Lethal Weapons as Intermediate Force Capabilities



For more information on non-lethal weapons, see:

[https://www.rand.org/pubs/research\\_reports/RRA654-1.html](https://www.rand.org/pubs/research_reports/RRA654-1.html)

<https://www.rand.org/blog/2022/06/revealing-the-impact-of-non-lethal-weapons.html>

<https://www.rand.org/blog/2022/04/effective-use-of-nonlethal-weapons-could-require-combating.html>

# Example of Using Non-Lethal Weapons: Aerial and Maritime Standoffs

- Countering Russian aircraft intrusion attempts
  - If Russian aircraft engage in dangerous behavior, could briefly use a laser dazzler, the Long-Range Ocular Interrupter (LROI), to complement TTPs
    - A flash of glare would not seriously impair pilot, but would add pressure to back off
    - No permanent damage—this is an eye-safe laser without aftereffects
- Countering Russian ships confronting U.S. commercial vessels in U.S. waters
  - Again, flashes of glare with eye-safe laser dazzlers could encourage other side to back off
  - The Active Denial System (ADS) could be used to discomfit personnel on deck with a temporary heating sensation
  - Maritime Vessel-Stopping Occlusion Technologies (MVSOT) to entangle propellers
  - The Vessel Incapacitating Power Effect Radiation (VIPER) to shut down engines

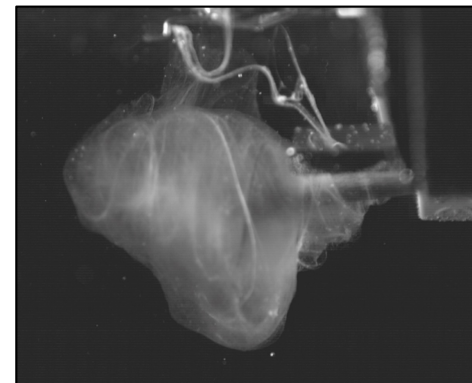
*Long-Range Ocular Interrupter*



*Active Denial System*



*Maritime Vessel-Stopping  
Occlusion Technologies*



# Example of Using Non-Lethal Weapons: Securing HA/DR Operations

- Military forces are providing relief after a hurricane in Louisiana
  - A self-described militia attempts to interfere with relief efforts, threatening people entering aid facilities and conducting “drills” just outside cordoned-off areas
  - They are also using boats to approach Navy and Coast Guard vessels operating in the Mississippi, then they brandish their weapons and fire into the air
- In this context, various types of non-lethal weapons could be used:
  - Acoustic hailers to warn and laser dazzlers to create glare
  - The Active Denial System (ADS) to cause a temporary heating sensation
  - The Laser-Induced Plasma Effects (LIPE) to create voice effects behind the protesters, on land or in the water
  - As before, could use MVSOT to entangle propellers and/or VIPER to shut down engines

NORTHCOM and the services can consider how to employ existing and emerging non-lethal weapons as part of homeland defense

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# Blockship Tactic: Sinking Old Ships in Key Channels to Block Passage

- The Suez Canal blockage of March 2021 was an accident, but also a reminder of the effectiveness of this tactic
- Clearing a deliberately sunken ship takes critical time, giving the initiative to the attacker while the other side is trapped
  - Nefarious tactics can prolong timelines and elevate risk

*An abrupt unplanned stop in the Suez Canal*



*Russia used blockships to trap the Ukrainian Navy in port in 2014*

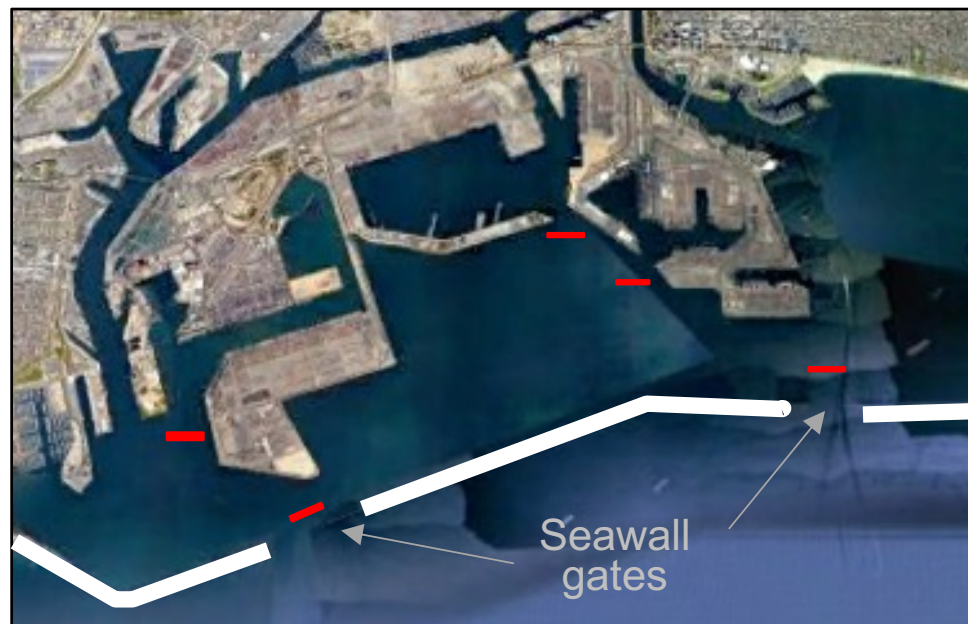




# The U.S. Is Vulnerable to Blockship Attacks

- The U.S. could use blockships in some contingencies, but here, we're focused on blockship threats to U.S. ports
- An apparently legitimate commercial ship could suddenly and rapidly scuttle itself in a channel
  - Unless tugboats were close by and had prior authorization, they might not be able to prevent the ship settling to the bottom
- Closing channels in major ports, such as the Ports of Los Angeles and Long Beach, would have a huge economic impact
- Closing access to key DoD locations, such as Norfolk, San Diego, or Military Ocean Terminal Sunny Point, could stymie warplans
  - All services depend on maritime transport

*Ports of Los Angeles and Long Beach*



Red rectangles are the size of the *Ever Given*

## The Suez Grounding Was an Accident. The Next Blocked Chokepoint Might Not Be.

Military planners must bear in mind the tactic of blockships.

BY SCOTT SAVITZ  
SENIOR ENGINEER,  
RAND

The recent spectacle of the hulking container ship wedged into the Suez Canal is a reminder of how vulnerable maritime transportation is to blocked chokepoints. While the *Ever Giving* appears to have gotten stuck by accident,

# Approaches to Preventing and Mitigating Blockship Attacks

- ISR can help to anticipate some attacks, but not reliably enough to consistently prevent them
- Stopping a vast ship through the use of external force may require substantial warning (miles before the ship reaches its target), and involve risks of collateral damage
- Non-lethal approaches may be useful in stopping a ship
  - e.g., Maritime Vessel Stopping Occlusion Technologies (MVSOT), the Vessel Incapacitating Power Effect Radiation (VIPER), or electronic warfare or cyber means of taking control of the ship
- To address a blockship attack that succeeds (or more than one), it is necessary to ensure rapid clearance, requiring:
  - Environmental characterization of key waterways
  - Adequate divers and equipment for underwater demolition and salvage
    - Training with allied divers can facilitate their assistance in a crisis
  - UUVs that can roam throughout the wreck to collect information and assist divers
  - Tabletop and live exercises that include multiple DoD services, the Coast Guard, allied militaries, the Department of Transportation, the Intelligence Community, state and local authorities, and other stakeholders

For more on blockships, see:

<https://www.defenseone.com/ideas/2021/03/suez-grounding-was-accident-next-blocked-chokepoint-might-not-be/173011/>  
<https://www.usni.org/magazines/proceedings/2021/december/blockship-tactics-trap-enemy-fleets>  
[https://www.rand.org/pubs/research\\_reports/RR384.html](https://www.rand.org/pubs/research_reports/RR384.html)

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# Mine the Skies to Counter Incoming Missiles

- A novel approach to protecting U.S. military bases and other key locations from conventional missile attacks
  - Designed to complement existing and other potential missile defenses
  - Particularly relevant where potential targets adjoin relatively open areas
- Create the aerial equivalent of minefields
  - Zones in the sky that inflict damage when a missile passes through them
  - This is easier than precisely targeting a fast-moving, maneuverable missile

# Approach to Creating Aerial Minefields

- Elegantly simple, low-cost UASs would linger in the vicinity of areas to be protected
- They would migrate towards the paths of incoming missiles when directed by ground-based C<sup>4</sup>ISR
  - Distributing themselves in space to cover a substantial area
- When directed, the UASs would dispense hard, razor-sharp shards, creating hazardous fields for the missiles to pass through
  - The shards would be gradually released to create a distributed cloud of material
  - Timing and positioning would be selected to roughly coincide with the missiles' arrival
    - Taking into account both gravity and ambient winds



# Result: A Series of Nasty Collisions

- The shards would gouge advanced coatings and claddings that protect the core of the missile from intense heat
- Sensors along the surface of the missile would be blinded as hard objects shattered and sliced them
- The missile's surfaces would change due to missing chunks of material and impaled shards
  - Distorting its aerodynamics in ways that its guidance algorithms were not designed to handle
- Deep penetration of some shards could sever critical wires, tubes, or IT systems
- Air-breathing missiles would suck shards into their engines
- The faster the missile goes, the more damage it experiences
  - Martial-arts cliché: using opponent's strength against them

# Putting the “Miss” Back in “Missile”

- Sometimes, the damage would destroy the missile
  - Heat and mechanical stresses, plus failures of key systems, can lead to self-destruction
- A damaged missile is more vulnerable to other types of targeting
  - It likely has some combination of elevated heat signatures, damaged coatings, reduced maneuverability, and incapacitated EW defenses
- A damaged missile that survives is much less likely to hit the target
  - Engineering principle: unplanned high-speed collisions tend to degrade the performance of sophisticated systems
  - The sound and fury of its detonation may be loud, but the target is safe

A low-cost method of damaging some missiles enables other defenses to more effectively eliminate the rest

# Use Current Technology to Achieve Low Costs and Minimal Development Risks

- UASs would be designed for one mission and require little autonomy
- Shards could be made of ceramics, low-cost composites, or possibly tungsten or titanium
  - Even the metals would cost just a few hundred dollars per ton, with no maintenance required
- Shards could have varied shapes
  - Flat shapes with sharp edging to slice
  - Pellets to penetrate
  - Long shapes to impale

# Recap

- Existing and emerging non-lethal weapons could be useful in homeland defense contexts
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