

Appendix

A

Non-Lethal Weapons in the Architecture for Force Protection

A large number of commercially available personal watercraft occupy the waters near ports where the Navy's ships are at anchor in the harbor. Intrusions into spacing "unacceptably close" to a ship may take place innocently (for example, by civilian crafts, such as fishing boats or pleasure boats) or by forces intent on harm. Civilian opposition to a military operation offers a particularly effective cover for hostile intent by terrorists.

Many of the procedures that are emerging within the AT/FP initiative involve non-lethal weapons and procedures. When a U.S. Navy ship enters the port of a foreign country, a substantial—and growing—series of checks must be completed to assess the risk of terrorism or threats from hostile individuals or groups. As a result, additional coordination and attention are needed from the host nation before the arrival of a U.S. vessel. Because of the complex nature of a professional "sweep" to ensure security, the formation of a maritime ships security augmentation force (MASSAF) is under consideration. This force would arrive at an intended port before a ship's arrival, and it would sweep buildings close to port, ensure that the necessary security operations had been taken, and enhance security through acceptable means.

As described in Section 1.2, the primary force protection architecture for ships in ports involves layers, or zones, related to the nature of a potential threat. Any approaching watercraft could pose a potential threat if it came within a specified distance of a ship, that is, within Zone 1 (or the "outer defense bubble," in three dimensions). If that happens, action is taken to warn the approaching craft to keep its distance and also to determine if the vessel is either hostile or unaware that it is a potential threat to the ship. Warning signs, lights, audible warnings (sirens, horns), or other perimeter indicators are appropriate at this

distance. If the vessel approaches closer, within Zone 2 (the middle zone), a series of non-lethal warnings or actions may be employed. These should be intense enough that any innocently intruding vessel clearly recognizes its vulnerability to attack if it continues to come closer. If the approaching craft enters Zone 3 (the inner zone), the intent of the approaching craft can be assumed to be hostile, and lethal actions may be employed.

A high level of uncertainty exists when a vessel is in Zone 2. The rules of engagement specify that every commander has the right to defend his or her own ship, and may use lethal means when necessary. Because of the short time it may take a high-speed personal watercraft to approach a stationary vessel, ROEs must be delegated to individuals able to take necessary action. If, for example, an approaching vessel is traveling at a speed of 90 knots from 2,000 to 1,000 yd, a sailor charged with ship security has limited time to make a decision and act. The sailor must have a clearly defined set of actions for dealing with increasing levels of lethality: that is, (1) assess, (2) warn, (3) threaten, (4) intimidate, (5) incapacitate (personnel or materiel), (6) disable, (7) damage (materiel), and, finally (8) destroy. Non-lethal methods allow the sailor to take steps (2) through (7) before employing lethal procedures. Crews must be properly trained and have the authority to take actions in sequence to handle complicated and rapidly changing scenarios.

Actions in Zones 1 and 2 that may be taken, or that are under consideration, as a result of the AT/FP initiative, include the following:

- *Detection.* Detection of vessels that intrude into Zone 1 is obviously necessary. Sentries, electro-optical devices, radar, and sonar may be used extensively to determine the presence of objects within a designated distance. New detection devices may be appropriate to enhance the ability to detect small boats, subsurface swimmers, approaching small aircraft, and intruders in land vehicles or on foot. Available technology for detection can meet many needs; once requirements are determined, effective systems can be designed.
- *Attention-getting actions.* Signs indicating the limits of a perimeter defense may be placed at appropriate locations to warn approaching vessels. Horns, sirens, or lights may be used to get the attention of an approaching vessel. Sentries may attempt to provide warnings, and animated warning signs may be triggered. These items represent low-technology methods readily available for implementation at minimal cost. Training in their appropriate use is required.
- *Non-lethal actions with lethal weapons.* Firing a shot across the bow of an approaching vessel is clearly overt non-lethal action that has been recognized for centuries and which represents a recognized signal that if no change in course is taken, a lethal shot may be fired. Besides endangering other activities in the area, such action would be deemed extraordinary and could be offensive to the host country providing port security. Alternative actions involving non-lethal procedures are highly preferred and are being developed.

- *Riot control agents.* A variety of riot control agents such as rubber pellets or batons, water cannons, flash bangs, pepper spray/balls, and other chemical lacrimators or irritants, may be used under the restrictions of the Chemical Weapons Convention. Combinations of agents can also be considered (e.g., mixing lacrimators with water cannons). The delivery of riot control agents to small vessels with remotely piloted watercraft or unmanned aerial vehicles may be appropriate for the distances and situations anticipated in such encounters. This option requires system design and development.

- *Detection of offending materials.* If a vessel is to be boarded, either in the AT/FP scenario or using enforcing sanctions, detection to determine the presence of offending substances onboard may be necessary. Chemical sniffers capable of detecting the presence of explosives are available, and improvements in packaging are under development. Current methods are effective only at very short range (i.e., about 1 ft) and require some sort of remotely controlled platform to get the sensor close enough to detect a substance. Future advances, while offering improvements in sensitivity, may still require remotely controlled deployment means.

- *Vessel stoppers.* Vessel stoppers, such as the running gear entanglement system, are under development. Exhaust stack blockers have been evaluated but are not attractive because of the difficulty of placing the blockage in the exhaust stack of a vessel. Casting a net across the bow of a vessel (sea anchor vessel stopping system) has been suggested; the net is attached to parachute-shaped drogues that open and impart considerable resistance to the continued motion of a vessel. Delivery of this system, or of RGES, remains a challenge. Remotely piloted small craft are being tested to assess their ability to perform this delivery function. An alternative proposal is a small craft disabler, which inserts a spear into a hull at the waterline and deploys a fin that drags in the water, making steering impossible.

- *Surface patrol vessels.* Small-craft patrols operating in conjunction with a docked ship allow closer monitoring of any vessel entering Zone 1; they are being proposed as standard operating procedure for vessels in port. The delivery of warnings, vehicle stoppers, or other items for which a close approach to an offending vessel is required may represent a substantial challenge. The Coast Guard reports that high-speed personal watercraft and other high-powered vessels frequently outrun pursuing Coast Guard vessels. A relatively inexpensive jet ski to which a remote control and monitoring system may be attached is commercially available at an estimated cost of approximately \$50,000. Speeds up to 90 knots in calm water are advertised. This "Roboski" has successfully deployed RGES to stop a boat. Costs of the Roboski/RGES system are about \$87,000. A Roboski platform might also be used to deploy a drag chute over a vessel; warning devices such as sirens, flashing blue lights, strobe lights; flash-bang munitions; pepper spray; blunt trauma munitions; or a water cannon. It might also be

used as a ramming device. These ideas are under consideration for countering the threat of a high-speed intruding or escaping vessel.

- *Unmanned air vehicles.* Various unmanned aerial vehicles have been suggested for patrolling the airspace. One recommended by Systems Research and Development Corporation (SRDC) weighs 30 lb, has a 10-ft wingspan and 30 hours' endurance, and costs \$8,500 with a data link. The loitering electronic warfare killer (LEWK) is another vehicle that can be launched from various guns or launch systems to provide over-the-horizon monitoring.

The measures described here address hazards that may approach a ship on water. Additional threats may appear underwater. Sonar monitoring can detect the presence of such threats. Actions to minimize risk if such intrusions are detected include (1) acoustics; (2) counterdiver activity; or (3) subsurface munitions (which may be lethal).