

2013 Naval Mine Warfare Essay Contest Winner

LEARNING FROM IEDs

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Dealing with roadside bombs in Afghanistan and Iraq prompted the Army and Marine Corps to make major changes in their equipment, tactics, and force structure. The Navy can adapt many of them for its mine-countermeasures effort.

It's time the Navy's mine-countermeasures community took a serious look at the lessons learned by the U.S. Army and Marine Corps in dealing with improvised explosive devices (IEDs) in Afghanistan and Iraq over the past 12 years.

At first blush, trying to transplant the technologies, tactics, and force structure for combatting IEDs to help deal with naval mines may seem a bit incongruous. IEDs, of course, are most familiar as *roadside* bombs, while naval mines are deployed in harbors and at sea. What could be further apart?

In truth, however, the two categories of weapons have similar characteristics—and pose the same fundamental threats to our forces. Both IEDs and naval mines are inexpensive, easy to build or acquire, and can be delivered under cover—by truck or car in the case of IEDs and by dhows, junks, and small merchant ships for naval mines in close-in waters. Both can be deployed defensively (and protected by the enemy's weapon systems) or else used offensively (to impede land traffic or make sea lanes more treacherous). Even the way critical ports and unavoidable chokepoints are linked by Q-routes—narrow channels that have been swept and cleared of mines—evokes our route-clearing counter-IED campaigns in Afghanistan and Iraq.

Indeed, we can learn a lot from what U.S. ground forces have done to achieve their successes against IEDs. And it would behoove us to review their experiences, lest we end up having to pay once again at sea for what they have already learned at great cost on land.

The issue is important because the stunning changes in the global geopolitical picture over the past 15 years have intensified the threat posed by naval mines. Potential adversaries such as China or Iran now have access to increasingly sophisticated sea mines that require advanced technology and better-coordinated on-scene tactics to counter. And where mining a harbor or sea lane once was solely the province of the world's major navies, these days it can be done by smaller insurgent forces or rogue states as well. The suicide attack on the USS *Cole* (DDG-67) in Aden in October 2000 made that

point clearly, and subsequent operations by small civilian boats in other Middle East harbors have reinforced it.

Moreover, the Navy's mine-countermeasures “triad”—comprising specialized ships, helicopters, and explosive ordnance disposal (EOD) divers—is facing some challenges. Our aging *Avenger*-class mine-countermeasures ships and MH-53 Sea Dragon helicopters already are operating well beyond their recommended service lives. And our EOD teams have spent the past several years supporting the Army and Marine Corps in intense combat ashore and need to refocus on underwater tactics.

To be sure, the picture isn't all bleak. The Navy's newest submersible robots such as unmanned underwater vehicles (UUVs) and remotely operated vehicles (ROVs) have proved successful in mine-countermeasures operations. And help is on the way with a new platform for deploying them—a specialized littoral combat ship (LCS), equipped with state-of-the-art mine-countermeasures mission modules. The system is still being developed and is expected to join the Fleet in increments over the next several years.

Needed: A Major Transformation

Even so, for the U.S. Navy to meet the new challenges and field a modern and effective mine-countermeasures force, it will require a conceptual transformation. We already have the technology, the platforms, and the organizational structure to create a maritime version of what has proved successful on land. What we need to do now is leverage these assets and fully integrate mine countermeasures into the rest of the Fleet. Studying what the Army and Marine Corps have done in Afghanistan and Iraq would be a good start.

Many of these transferable lessons are readily apparent. Perhaps the best-known innovation by our counter-IED forces in Afghanistan and Iraq has been to introduce the wide use of small, mobile robots to defuse roadside bombs, significantly reducing the risk for EOD technicians assigned to that task. More than 10,000 such land robots have been sent to the region in the past few years.

In Afghanistan and Iraq, U.S. ground commanders restructured their forces to make them better equipped to analyze and exploit intelligence on the IED threat. They created a broad new database that permitted their units to organize the massive amount of IED-related information that streams in every day and helped them find weaknesses in the bomb-makers' technology and detect patterns in enemy activity. This led to the

U.S. MARINE CORPS (TYLER B. BARSTOW)

Corporal Raul Cardenas of the 1st Marine Logistics Group prepares a remote control robot to search for possible improvised explosive devices during a training mission at Marine Corps Base Quantico. Based on their experience in Iraq and Afghanistan, the Army and Marine Corps have fully integrated EOD personnel into infantry and armored units. The author argues that the Navy could benefit from including mine-countermeasures specialists in pre-deployment planning and preparation.



U.S. NAVY (DANIEL GAY)

The USS *Ponce* (AFSB(I)-15), a onetime amphibious transport dock ship converted to an interim afloat forward staging base for mine-countermeasures testing, soon will deploy the Navy's first laser weapon system. In the foreground, a Mark 18 Mod 2 unmanned underwater vehicle (UUV) submerges after being launched from a rigid-hull inflatable boat (RHIB) during the 2013 International Mine Countermeasures Exercise in the Persian Gulf last May.

development of new tactics that enabled them to target the networks of people and supplies that the insurgents were using to build and plant the IEDs.

This isn't just another turf issue. With so many rogue states and insurgent groups, quashing both IEDs and the naval mine threat these days means pinpointing and wiping out the networks that deploy them—and that takes a sleuthing capability that Navy MCM squadrons currently don't have. Although our units are effective at locating and destroying naval mines, they don't have the personnel or technology to exploit, analyze, and assess the enemy's actions—a shortcoming that effectively limits them to defensive measures and impedes them from conducting offensive MCM operations.

Indeed, the targeting method that has proved successful in the counter-IED campaigns in Afghanistan and Iraq—known as F3EAD, for find, fix, finish, exploit, analyze and disseminate—requires uniquely skilled personnel who currently aren't included in our forward-deployed MCM squadrons.

Integrated Forces

Perhaps most important, counter-IED forces have been *fully integrated* into primary Army and Marine Corps infantry and armored units before deployment—and have been playing a key role in the planning and implementation of U.S. ground actions.

Critically, the Navy hasn't done that yet. Under our current organizational structure, all operational MCM ships and aircraft are forward-deployed, making it difficult for the various elements of our MCM forces to coordinate their plans and activities until *after* a ship, EOD platoon, or helicopter detachment deploys. In fact, the first time

some EOD technicians actually see an *Avenger*-class MCM ship is after they have *arrived* in theater.

Someone Else's Problem

Indeed, far too many naval officers seem too quick to look past the mine threat. Some of this is natural: surface warfare officers, submarine officers, and naval aviators commanding our strike groups all have been trained to attack targets. A mine is only an obstacle, not the main objective of a battle. Yet many seem to regard the naval mine threat as somebody else's problem. The bad habits and wishful thinking that are nurtured by our failure to integrate MCM forces into strike group operations stay with our officers even after they become commanders themselves. (Note: It was only after Army and Marine Corps infantry and tank commanders realized that combatting IEDs was *their* problem as well as that of the counter-IED teams that we began to make some progress.)

Retired U.S. Army Colonel Kevin Lutz, commander of Combined Joint Task Force Troy in 2005-06 and 2008-09, said the innovations developed for the counter-IED campaign in Afghanistan and Iraq “literally changed the course and success of our [effort]” by facilitating the technical data and intelligence. They also led to the development of new and advanced protective equipment and gear for counter-IED forces, of specialized IED detection and disposal technology, and a comprehensive collaboration of weapons technical intelligence and forensic data used in all-source intelligence analysis.

The Navy could benefit greatly—and could readily adapt—many of the techniques and technology that the ground forces have found effective. We can begin

immediately to tap the valuable lessons we've learned from the military's decade-long experience—and hard-won successes—in dealing with IEDs, and use them to restructure our naval mine-countermeasures.

What the Navy Could Do

Admittedly, this will require some careful thought—and planning. We can't just take what the ground forces have done and paint it gray.

Here are some suggestions:

- Incorporate more robots such as UUVs and ROVs onto existing ships and aircraft.
- Augment our current MCM squadrons with specialists skilled in technical exploitation and analysis, and create a Fleet-wide database to help them record and analyze intelligence on naval mines.
- Integrate MCM personnel and teams into all the Navy's strike groups, both at the planning levels and before and during actual deployment, and ensure that they are given a voice in how operations are organized and carried out.

One of the earliest uses of robots during Operation Iraqi Freedom, in April 2003, was actually in naval mine countermeasures, when Naval Special Clearance Team 1 cleared the muddy, polluted harbors of Umm Qasr and Az Zubayr, using Mark 18 Mod 1 UUVs. Flown into the captured port by helicopter and launched from the pier, the UUVs' sonar equipment gathered important environmental data and accurate coordinates, enabling divers to identify objects and reduce the number of dives.

These UUVs can be programmed to run a pre-set pattern. And they provide the most stable platform for installed sensors—primarily sonars—to identify mine-like objects. Their ability to operate independently from a supporting ship prevents the enemy from identifying the areas being searched and allows MCM ships to stand off safely from both the minefield and the covering weapons systems of the enemy.

Ashore, robots became standard equipment for EOD teams, which supported every maneuver battalion to which they were assigned. Since robots are manufactured in a variety of sizes and with different capabilities, no single model fulfilled all of a mission's requirements. Light robots are easier to carry, but they lack the strength needed to deal with some types of IEDs; other models were equipped with better cameras, mounted on longer arms; still others were better at functioning in buildings. These same concepts apply to robots for missions at sea.

Our Robot Inventory

The smallest UUVs, such as the Mark 18 Mod 1 used to clear Umm Qasr, Iraq, can be carried by a single sailor. Though limited in duration, these UUVs contain sonars, environmental sensors, and highly accurate navigation and positioning, and can enable the smallest ships or ports to conduct intelligence-driven MCM operations. An eight-man EOD platoon reinforced by a two-man UUV team can be flown on short notice and conduct full mission-profile MCM operations. This concept was proved by an EOD platoon from the USS *Peleliu* (LHA-5) during the 2003 Mine Warfare Readiness and Effectiveness Measuring exercise, known as MIREM 27, in the Persian Gulf. After two weeks of training, the platoon was reinforced by two Mark 18 Mod 1 UUVs and transported by helicopter to the USS *Jarrett* (FFG-33). From the *Jarrett* and her 29.5-foot rigid-hull inflatable boat (RHIB), the platoon planned and executed a search of an exercise minefield in which it handily located all of the mine shapes in the area.

Lightweight UUVs such as the Mark 18 Mod 2 now deployed to the 5th Fleet have a longer range and greater depth capability. Equipped to collect very high-resolution data on several square miles of sea floor, they are well suited for targeting a designated mine danger area. Currently deployed from RHIBs in the 5th Fleet and on the decks of hydrographic survey ships



U.S. NAVY (COLBY DRAKE)

Sailors on board the mine-countermeasures ship USS *Gladiator* (MCM-11) launch a Seafox mine-hunting ROV. The author says the Navy has begun using high-technology submersible robots, but needs to revamp its force structure and tactics to take advantage of the new equipment.



U.S. NAVY (AMAR PERRY)

A rigid-hull inflatable boat assigned to Combined Task Group 56.1 launches an unmanned underwater vehicle during a mine-countermeasures exercise in Bahrain. The author says the experience gained should prove useful for the new littoral combat ships, which also carry RHIBs.

around the world, these UUVs require a simple launch-and-recovery system. The same 36-foot RHIBs now operating UUVs are also being launched and recovered from LCSs, so it ought to be easy to integrate them into the vessel's mission modules. Developing a bolt-on, bolt-off launch-and-recovery system would give our Fleet the option of an MCM capability on our destroyers and frigates as well as on MCM ships and in the well decks of our amphibious ships. Weighing less than the now-canceled AQS-20 and OASIS systems, these UUVs also show potential for operations from the Organic Airborne MCM MH-60S helicopter equipped with a carriage stream tow and recovery system (CSTRS). A merger of these programs would enable every ship capable of MH-60S helicopter operations to stand off approximately 100 nautical miles and hunt or conduct hydrographic reconnaissance.

Heavy UUVs such as the 18-foot, 1,900-pound Hugin, operated by the navies of several of our NATO allies and commercial hydrographic companies, offer the greatest endurance and the most powerful sensors. Equipped with synthetic-aperture sonars, they collect high-resolution data out 850 feet or more per side on a single pass. With durations of 50 to 70 hours at three knots (and maximum speeds of up to six knots), these UUVs are well-suited

for surveying mine-threat areas. Though they require a larger footprint and aren't suitable for helicopter or RHIB operations, the fact that they can search such a large area during each mission makes them our best platform for verifying Q-routes and potential operating areas without giving away our future locations and routes to the enemy.

ROVs: A Variety of Uses

Remotely operated vehicles, most similar to the ground robot, are essentially an extension of the operator, and they've been proved by years of heavy commercial use. Since they provide real-time sonar and video images and enable the operator to mark or manipulate objects or "finish" a mine, they constitute an ideal system for searching for swimmer-placed limpet mines. They also offer a low-cost way for crews to inspect their own ship's hull, precluding the need to use EOD teams to conduct anti-terrorism force-protection dives. Finally, with enemy mine inventories burgeoning, using multiple UUV- and ROV-equipped EOD teams would greatly enhance our mine-countermeasures coverage and enable us to neutralize many more mines.

As was the case with the early counter-IED forces that the United States deployed in Afghanistan and Iraq, the Navy's current MCM structure is capable of locating

and destroying naval mines, but it lacks the ability to exploit, analyze and disseminate intelligence concerning the enemy's actions—i.e., for attacking the naval and insurgent networks that typically launch sea mines.

Some Practical Suggestions

There are several ways the Navy can improve this situation:

Create combined explosives exploitation cells. What U.S. ground forces did to solve this problem was to create combined explosives exploitation cells (CEXC)s—inspired by those that the United Kingdom assembled during the conflict in Northern Ireland—that drew on weapons specialists from a variety of military and civilian agencies. They also created a comprehensive database to coordinate technical intelligence and forensic data. A maritime version of CEXC could have a strategic impact: a recovered mine not only can provide MCM analysts with technical details about its operations, but it also can provide proof of who manufactured and laid the mine.

Exploit other Navy analysis capabilities: The Navy could do more to tap the expertise that the oceanographer and meteorologists from the Naval Meteorological and Oceanographic Command provide to submarine commanders. The oceanographic office already operates towed side-scan sonars and the Littoral Battlespace UUV (a version of the Mark 18 Mod 2 UUV) carried by the T-AGS-60 oceanographic-survey ships that it uses to develop nautical charts. And the officers and sailors of the Naval Oceanographic and Mine Warfare Command are most familiar with interpreting this type of sonar data for MCM missions.


Create an easily searchable database and network for dissemination: The ground forces' counter-IED efforts have produced volumes of technical intelligence and forensic evidence on thousands of different IEDs, which now have been stored and cataloged in easily searchable databases. Our own MCM ships' surveys of Q-routes and mine-threat areas generate a similar wealth of knowledge, but we don't yet have a means of accessing it Fleet-wide. Our skill in identifying new contacts will rest partly on the ability of our MCM teams to inform their assessments with knowledge of historical survey data that identifies the most likely and most dangerous areas for enemy mining. Having this kind of data available would reduce post-mission analysis times, since change-detection software can filter out previously known mine-like objects and single out new objects for examination. When new mines

and enemy tactics were discovered, the database analysts could alert the Fleet and offer guidance on how to counter them.

Using more high-technology robots and revamping our MCM force structure will help make our efforts more effective, but they will only go so far. While armored and infantry divisions ashore have completely integrated the counter-IED forces into their units, the Navy has kept our mine-countermeasures forces largely separate. As a result, our carrier and amphibious ready groups and our expeditionary strike groups are hamstrung. Indeed, they can't even train properly until after they deploy and finally link up with the mine-countermeasures squadrons.

Unless the Navy gains from the experiences of our of U.S. ground forces in Afghanistan and Iraq, our MCM squadrons will remain forward-deployed and unavailable for pre-under way training for several more years—until the Navy completes development of its mine-countermeasures mission modules for LCSs and of UUVs and ROVs. Yet, if we take the first two steps that I proposed, integrating the mine-countermeasures forces into the Fleet becomes a natural third.

To accomplish this, commanders should place MCM coordination teams on the staffs of their strike groups well before their vessels are deployed and ensure that they are involved in supporting all targeting functions and in pre-deployment planning and training. Such a move would produce a more responsive mine-countermeasures effort and later provide the emerging LCS program with the added benefit of a crew that has had fleet exposure to mine-countermeasures concepts and unmanned systems and can help develop new doctrine.

As the conflicts in Afghanistan and Iraq have shown, relying solely on new technology to counter the growing threat from mines is doomed to failure. Over the course of 12 years of war, the enemy has adapted its IEDs to every countermeasure that we have fielded. Fortunately, the changes that our ground forces made have enabled them to recognize the enemy's maneuvering and stay ahead. A well-integrated Navy mine-countermeasures force will also be able to recognize the enemy's inevitable adaptations, develop new tactics, and disseminate this information across the Fleet. 

2013 Naval Mine Warfare Essay Contest Winners

First Prize:

**Commander Thomas S. Reynolds,
U.S. Navy (Retired)**
Learning From IEDs

Second Prize:

Peter von Bleichert
"Mines Can Wait. Can We?"

Third Prize:

**Lieutenant Colonel Michael F. Trevett,
U.S. Army (Retired)**
"Naval Mine Warfare: Historic,
Political-Military Lessons of an
Asymmetric Weapon"

Commander Reynolds, who retired in 2012, is a former Navy explosive ordnance disposal (EOD) officer who participated in six deployments in Operation Iraqi Freedom, most recently as commander of the 5th Fleet EOD and diving task group.