

SPECIAL ISSUE

MILLEY The 2016 AUSA Annual Meeting

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Exploring a shore-to-ship Fires

TRADOC Big 6+1 Capabilities

capability for the U.S. Army

Brian J. McKiernan Major General, United States Army Commanding General, Fort Sill, Okla.

Purpose

Originally founded as the Field Artillery Journal, Fires serves as a forum for the discussions of all Fires professionals, Active, Reserves and National Guard; disseminates professional knowledge about progress, development and best use in campaigns; cultivates a common understanding of the power, limitations and application of joint Fires, both lethal and nonlethal; fosters joint Fires interdependency among the armed services; and promotes the understanding of and interoperability between the branches, all of which contribute to the good of the Army, joint and combined forces and our nation.

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On the cover

Gen. Mark Milley, chief of staff of the Army, addresses the Congressional Staff Breakfast attended by approximately 300 military legislative assistants at the 2016 AUSA Annual Meeting, Washington, D.C., Oct. 4, 2016. (Sqt. 1st Class Jim Greenhill/U.S. Army National Guard)

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Milley addresses attendees of AUSA meeting

By Capt. Joshua Urness

The 2016 Association of the United States Army Annual Meeting and Exposition was held Oct. 3-5 in Washington D.C. More than 26,000 leaders from the Army, sister services and industry representatives were in an attendance.

Chief of Staff of the Army guidance

Gen. Mark Milley, the chief of staff of the Army, reinforced his priorities throughout the AUSA event stating that "readiness remains our No. 1 priority, but we must simultaneously build the right force for the future."

His second priority is to build an agile and adaptive Army of the future and his third priority is to continue taking care of Soldiers.

He said the Army mortgaged future readiness and modernization in order to adapt and sustain the fight in Iraq and Afghanistan. That modernization budget has been reduced by 70 percent in the last decade and by over 30 percent in the last three to four years.

He said acquisition reform is a top priority and the Army should focus on incremental adaptations and growth in existing systems, building new systems only by exception. He believes the Army's ability to see the elements of future wars and adapt accordingly is the only way to achieve success.

He said the world remains volatile, uncertain and complex, demanding high readiness. He stated the Army is facing tough strategic choices, and that the world is on the cusp of a change in the character of ground warfare. He related this period of transformation to other significant developments in history.

"Think of the shift from guidons and flags and drums, to the telegraph, telephone, and radio. I suspect that the organizations and weapons and doctrines of land armies between 2025 and 2050, in that quarter century period of time, will be fundamentally different than what we see today, and will likely have in the few years ahead."

He said conflict between nation states is "virtually guaranteed at some point" and the Army needs to prepare to fight a "high-end, near-peer adversary," in a likely "multi-polar future." He said our ability to do that has eroded over the last 15 years.

With increased urbanization and over 60 percent of the world's population living in cities by 2050, Milley said future wars will surely be fought in urban terrain. Finally, he said the proliferation of information technologies will diffuse state-based power and has created a new domain of warfare. Coupled with the rapid development of robotics and unmanned and human machine teaming, these issues will have a large impact on ground warfare, as well as the world economy.

Capabilities

Exhibitors at the AUSA convention center used the event as an opportunity to demonstrate innovation and incremental advances in technology that seek to nest with future operational and functional concepts. Several of the demonstrated capabilities enhanced current or existing Fires platforms. This included a special focus on counter-unmanned aerial surveillance, using direct energy weapons mounted on mobile platforms currently in the Army inventory; as well as adaptations of current field artillery weapons, mounted on a vehicle that boasted a more rapid emplacement and march order, while still delivering the same firepower.

In addition to the capabilities listed above, there was an emphasis on unmanned vehicles, robotics/autonomous systems, such as an unmanned-Stryker, 40 mm grenade launchers and M240-B (which looked like a tripod mounted version of the Common Remotely Operated Weapon System or CROWS). There was also a trend of material solutions for the reduction of a platform or locations electromagnetic signature. These systems nested well with the "Third-Offset Strategy" discussion.

The future of Fires: Multi-domain battle

The AUSA Exposition boasted almost 15 professional development forums and panel-based discussions each day, led by senior leaders from the Department of Defense, think-tanks and other key stakeholders in the Army's future. Several themes dominated the week, to include readiness and modernization and the need for reform in the acquisitions process.

Of extreme significance to the Fires community was the discussion about a new concept for land warfare, currently pioneered by the Army Capabilities Integration Center, called the multi-domain battle. The concept highlights what land forces can contribute to future warfare from a joint-operational perspective and placed significant emphasis on the ability to project Fires across domains, over long distances.

Lt. Gen. H.R. McMaster described the purpose of the concept as "endeavoring to ... build capabilities into the Army to allow the Army what it used to do, and always has been able to do, which is defeat enemy forces on land, secure terrain to deny its use to the enemy, protect populations, consolidate military gains, but, increasingly, to project power outward from land into ... aerospace, maritime or cyberspace and across the electromagnetic spectrum."

As described by the AUSA panel, the Army needs to be able to deliver Fires through artillery batteries with surface-to-surface capabilities, surface-to-air assets and a shore-to-ship capability. In order to achieve this, emphasis will be placed on a greater ability for land forces to perform long-range precision strike, enhanced air defense capabilities that fill the short range air defense artillery capability gap, and a method of engaging adversary forces in the maritime or sea domain, which was described as a sort of anti-ship cruise missile capability (manned by Fires Soldiers).

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Capt. Joshua Urness was an attendee of the 2016 AUSA meeting.



Army looks to do more with what it has

By Jen Judson The U.S. Army must figure out ways to keep its aging aircraft flying, its vehicles driving and its networks streaming, all while addressing emerging capabilities fielded by creative, near-peer enemies who have invested heavily in defense.

Budget unpredictability has deeply stressed the Army's ability to modernize its equipment and processes — the service has taken roughly a 33 percent cut since the start of the decade.

As a result, the Army is in the process of taking stock of its current capability and in many cases has borrowed a page from the Greatest Generation's resourcefulness, coming up with innovative

ways to stay ahead of a long list of threats around the world, using what it already has resident within the branch.

"As your budget goes down, it forces creativity and innovation," Army Secretary Eric Fanning told Defense News in an interview shortly before the Association of the United States Army's annual convention. "There are lots of examples where we are having to think creatively about how we might tweak what we have, or integrate differently or combine differently capabilities that we have."

The Army is doing just that when it comes to addressing some of its most pressing capability gaps. For instance, observing Russia's incursion into Ukraine has shown the U.S. Army it isn't where it wants to be in: electronic warfare, defense against cruise missiles and unmanned aircraft systems as well as cyber protection, long-range precision Fires, lethality in combat vehicles, active protection systems and mobile protected fire power.

The Joint Light Tactical Vehicle (JLTV) is currently under consideration to also serve as a Light Reconnaissance Vehicle (LRV), something the Army has said it needs in the near-term as part of the combat vehicle modernization strategy unveiled at AUSA one year ago.

"Because we have faced budget pressures, ideally you would go out and you would buy or build a new reconnaissance vehicle," Lt. Gen. Michael Williamson, the Army acquisition chief's military deputy, said in an interview with Defense News at the Pentagon in late September. "But what we were able to do through the work of the acquisition community, the work of the requirements community and the operators is come to a solution that takes one of the variants of the JLTV, add both weapons and reconnaissance, intelligence and those types of things, and give us a solution that will allow us to add capability to our forces."

Army acquisition chief Katrina McFarland noted in a separate interview that the JLTV as the LRV is not yet set in stone, but was under serious consideration.

The Army is also working to add a 30 mm cannon onto Stryker armored fighting vehicles for the 2nd Cavalry Regiment in Europe because the formation is currently deemed to be outgunned by its Russian counterparts.

On the aviation side, the Army made major changes to its fleet in the controversial Aviation Restructure Initiative (ARI) that moved to retire the OH-58 Kiowa Warrior armed scout helicopter and instead of buying something new — after failing to do so three times — opted to use AH-64 Apache attack helicopters teamed with Shadow and Gray Eagle aerial drones to fill the armed reconnaissance mission.

Also part of ARI, the service took LUH-72A Lakota light utility helicopters used in non-combat missions and, instead of competing and buying a brand new training helicopter when it decided to retire its TH-67 trainers, opted to use the Lakota for its basic rotary-wing training.

The service has also taken components across its inventory to create entirely new capabilities like the Integrated Fire Protection Capability Inc. 2–I (IFPC) to counter unmanned aerial systems and cruise missiles.

Originally developed to counter rockets, artillery and mortar (RAM) threats, the Army changed its focus to first develop a counter-UAS and counter-cruise-missiles capability due to threats cropping up in various conflicts like Russia in Ukraine and the Islamic State in Iraq and Syria.

The Army took its Sentinel radar, AIM 9x Sidewinder missiles and developed a multi-mission launcher internally, using current technology to build the IFPC system.

In addressing the counter-UAS threat, Lt. Gen. H.R. McMaster, Army Capabilities Integration Center director, said the Army took existing capabilities down to Fort Sill, Okla. last year, and tried things out. For example, the Army combined a software-modified radar with a vehicle from its inventory, giving the resulting mashup technology to units for experimentation.

The Army also tested a counter-UAS prototype at its annual Network Integration Evaluation in May this year. The C-UAS mobile integrated capability combines a vehicle already used by the

Budget unpredictability has deeply stressed the Army's ability to modernize its equipment and processes

service's fire-support teams, the Q-50 Counterfire Radar System, the Lightweight Laser Designator Rangefinder (LLDR) and Northrop Grumman's Venom mast, which transmits Q-50 radar information and supports the LLDR.

McMaster noted the Army has identified that its network is vulnerable, along with all communications systems, as threats in the cyber and electromagnetic domain are on the rise. "So we have to use existing capabilities differently," McMaster said, because the Army can't operate like it did in Iraq and Afghanistan, where it could broadcast on high-powered frequencies continuously.

"That's a bad idea," he said.

McFarland said there are several domains where the Army is very active in re-using capabilities already in the force. "Take a look at sensors as a simple one," she said. "Sensors do not care what they are tracking. ... So the data can be utilized by more than one asset in the battle space. So when we think of sensors neutrally and we think of them in terms of function, I should be able to change my architecture of the data and where it is distributed to cover more than one user of that data."

The result is a reduction in cost and burden to the Army, McFarland said. "It makes our Army more not only situationally aware, but tactically aware. ... If you just mentally expand your look, I can put that into missiles, I can put that into command or control, I can put that into sensors across the spectrum of the field."

A couple of organizations have been set up in recent years to help the Army look at its current capabilities with an eye on new uses.

The Strategic Capabilities Office, for example, is looking into new applications for the aging Army Tactical Missile Systems. The Rapid Capabilities Office, an initiative triggered by the new Army secretary in August, also will study repurposing existing equipment.

Jen Judson is the Defense News land warfare reporter. Judson has covered defense for over five years. Prior to joining Defense News, she was a defense reporter at Politico Pro and before that she covered Army aviation and missile defense at Inside Defense.com.



A Republic of China Navy Hsiung Feng II/III Anti-Ship Missile Launchers on a military vehicle at Zuoying Naval Base, China. (Wikimedia)

Exploring a shore-to-ship Fires capability for the U.S. Army

Shore-to-ship Fires, a capability long overlooked by the U.S. military, offers valuable potential solutions to challenging emerging problems. This paper explores the concept of shore-to-ship Fires largely through the lens of countering anti-access/ area-denial (A2AD) strategies; it examines potential advantages that shore-to-ship capabilities might offer and outlines potential requirements for successful employment of such capabilities. Finally, it examines potential opportunities for fielding this capability from near-term, mid-term and farterm standpoints.

The problem: A2AD

Throughout the late summer and early fall of 1990, the world watched as a 34 nation coalition, led by the United States, deployed

By Brad Marvel

nearly a million Soldiers to the Persian Gulf in response to Iraq's invasion of Kuwait. According to the Department of Defense, this deployment utilized nearly 19,000 strategic airlift sorties (over 100 per day) and no fewer than 344 ships to deliver 8.1 million tons of cargo over a six month period. At the time, this massive movement of personnel, equipment and supplies was heralded as a triumph of strategic logistics, but observers from around the world noted two enormous advantages that this operation enjoyed: the primary base of operations was literally next door to the target, and the movement of war materiel was virtually uninhibited. Iraq made no significant attempt to disrupt or interdict coalition movements into theater, choosing instead to focus efforts on fortifying and reinforcing their positions

in Kuwait. The result was, of course, after a lengthy period of buildup and with ample time to plan and position forces, the U.S.led coalition had little trouble overwhelming a large but militarily inferior Iraqi Army. Contemporary assessments from both Soviet/Russian and Chinese commentators both condemned this approach, noting the folly of attempting to out-muscle the world's strongest conventional force at the time and on ground of their own choosing, versus attempting to interdict, delay or prevent the initial buildup of forces.

The lessons from the Gulf War were of particular interest to the Chinese, who were in the midst of a substantial rethinking of their national strategy and their military at around the time Operation Desert Shield began. The fall of the Soviet Union and the liberalization of their government allowed Chinese political and military thinkers to expand their objectives outside Chinese borders. Chinese policy began to focus on developing regional strategic and economic hegemony in Southeast Asia, seeking the political and strategic advantages that come along with regional domination. At the same time, Chinese military strategy, no longer concerned with the threat of the Red Army invading Chinese territory, began to focus instead on winning localized, limited conflicts that might occur throughout the Pacific Rim. Having noted the advantages offered by the uninhibited buildup of coalition power prior to Desert Storm, Chinese planners placed much greater emphasis preventing potential aggressors from stockpiling combat power in theater wherever they like and at their leisure. They initially called this strategy "Local War under High-Technology Conditions," which eventually morphed into their current strategy: "Informationized Local War." The Department of Defense calls this strategy "A2AD," or "anti-access, area denial." Anti-access actions seek to affect movements to a theater, area-denial actions seek to affect operations within a theater. China, of course, is not the sole proponent of A2AD; it has become the de-facto standard strategy of every nation seeking to limit the ability of potential adversaries to project conventional power in their respective regions.

Anti-access, area denial as a strategy is not new; it is as ancient as military strategy itself. This most recent evolution of A2AD, however, is particularly challenging to the U.S. and her allies because of three key factors:

- Extremely long deployment distances coupled with ever-increasing lift and sustainment requirements for the U.S. and her allies.
- Rapid advances in intelligence, surveillance and reconnaissance (ISR) capabilities coupled with rapid promulgation of actionable targeting data to weapons systems.
- Proliferation of relatively inexpensive and highly capable weapons, such as ballistic missiles, cruise missiles, surface-to-air missiles, manned and unmanned aircraft, sea mines and submarines. In particular, the anti-ship ballistic missile is the current pinnacle of A2AD capabilities; this technology has the potential to fundamentally change U.S. naval strategy wherever it is encountered.

In short, U.S. and coalition forces must now move a lot of material through contested areas and then contend with precision weapons that can effectively target force projection assets at standoff ranges. Regional powers can now effectively project power over geographic areas far beyond their physical borders, denying opponents with greater conventional capabilities the ability to concentrate military power and bring their forces to bear. More advanced A2AD capabilities are able to effectively deny the U.S. and her allies the air and naval supremacy that has been a constant for the last half-century through both direct and asymmetric means. Ultimately, this strategy seeks to deny the U.S. and her allies what became the definitive show-offorce sequence after WWII: the deployment of the carrier battle/strike group and landbased air assets to a region, followed by light ground forces, followed by mechanized ground forces.

Ultimately, A2AD seeks to preclude decisive engagements against conventionally powerful, technologically superior opponents through asymmetric means. One of the core capabilities of a modern A2AD strategy is control of sea lanes, either through engagement or deterrence; one of the key contributors to sea lane control is shore-to-ship Fires.

Shore-to-ship Fires: A forgotten capability

Shore-to-ship Fires, in the form of coastal artillery, were a fixture amongst the world's militaries from the time gunpowder artillery was first fielded. For centuries the world's ports and coasts were protected by heavy caliber artillery, and it was considered absolutely foolhardy to engage shore batteries with even the most powerful ships. This was summed up by Adm. David Porter, who noted that during the American Civil War, "One gun on land was equal to three on the water."

Not all coastal artillery took the form of fixed heavy batteries, however. The modern U.S. Marine Corps, for example, was formed largely around a coastal artillery concept that strongly resembles a contemporary counter-A2AD strategy. During the late 19th-early 20th century, the U.S. acquired several pieces of territory far away from the continental U.S.: Hawaii, Guam and the Philippines among others. The U.S. Navy was, of course, chartered to defend the waters around these far-flung locations, which involved operating ships over previously unheard of distances. Ships of that era were mostly fueled by coal, which was a challenging commodity to supply. It was recognized that, in a major naval engagement, an opponent might attempt to simply cut the Navy off from its coal supply and thus starve the fleet in lieu of fighting a decisive engagement. Thus it was deemed necessary to develop a capability that could occupy, rapidly construct, and then defend hasty bases in austere locations. This mission fell to the U.S. Marine Corp, who in turn developed the "Advanced Base Force" as its concept for implementing these bases. A critical element of the Advanced Base Force was a deployable artillery battery intended to defend the base and any ships in the vulnerable position of refueling. The Marines even developed primitive cross-domain ISR capabilities to direct the fire of their 3- and 4.7-inch guns, using small boats equipped with spotlights and spotter aircraft to enhance the effect of their fire against hostile ships. Though the Advanced Base Force concept was abandoned prior to WWII, it can accurately be said that the U.S. Navy and USMC developed and implemented an effective integrated counter-A2AD concept over a century before AirSea Battle.

Operations in WWII, most notably Pearl Harbor, Singapore and Normandy, demonstrated that traditional fixed artillery emplacements were obsolete versus a combined-arms approach integrating air power and naval gunfire. The U.S. recognized this trend and shifted homeland defense capabilities to focus on integrated air defense, leaving sea control entirely the domain of the Navy. The last coastal artillery unit in the U.S. military was deactivated in 1950. Since then, the U.S. has not had a dedicated shore-to-ship capability.

Though coastal guns were rendered obsolete, several nations, the USSR foremost among them, took a serious interest in the potential of guided missiles as a means of sea control. The USSR recognized as early as 1944 that a direct confrontation of surface fleets with the Western Allies was not a feasible strategy. However, the USSR, learning from the German experience during the Second World War, recognized that interdicting American troop movements to Europe was a critical mission in any major conflict between themselves and the West. As such, they pursued an asymmetric anti-access naval strategy, focusing on the use of submarines, maritime aircraft and shore batteries as the means to impede allied shipping through sea denial across both

the north Atlantic and the western Pacific. The anti-ship cruise missile was the weapon of choice; simple designs such as the P-15/ SS-N-2 and the P-5/SS-N-3, both of which still widely proliferate today, were fielded in huge numbers.

The emergence of these effective anti-ship cruise missiles (ASCMs) prompted several nations to adopt simple truck-mounted launchers equipped with such missiles as inexpensive means of defending their own shores and controlling the surrounding littoral areas. Systems of this type conducted several successful engagements throughout the second half of the 20th century. Most notably, Argentina successfully engaged the HMS Glamorgan, a Royal Navy destroyer, with a MM38 Exocet missile during the Falklands War. Glamorgan was detected by a simple ground surveillance radar system, which passed targeting data to an improvised shore-based launcher. This engagement, along with several other ASCM engagements of varying effectiveness throughout the war, highlighted the growing threat of missiles to surface ships and provided strong evidence supporting their employment as a key component of any A2AD strategy.

As China began to adopt its dedicated A2AD strategy during the 1990s, it focused on several key enablers to enhance the capability of its anti-access systems. The first was a significant upgrade to its ISR network. Recognizing that quality ISR is the fulcrum of any A2AD campaign, China sought to incorporate air, space, surface and cyber sensors, utilizing visual, signal, electronic and infrared cues into the most accurate targeting data possible: a huge enabler to any precision system. China also fielded new delivery systems such as the DF-21D (the world's first anti-ship ballistic missile) and the CJ-10 (a land based dual-purpose anti-ship and land attack cruise missile). These systems, when targeted effectively, pushed engagement ranges out hundreds and even thousands of kilometers.

China's capabilities have been discussed above; Russia and Iran have adopted similar strategies with varying capability levels. This represents a significant threat to the traditional American method of power projection through forward deployment of her air and naval assets. If the U.S. and her allies are to maintain their positions as credible deterrents, new solutions must be conceived. In this case, an asymmetric approach adopting a strategy taken from one's rivals may be a possibility: shore-to-ship Fires play a crucial role in modern A2AD strategy; they may also play a role in defeating such strategies.

An updated shore-toship capability

Command of the sea has been a cornerstone of American military power since WWII. This cornerstone has not been seriously threatened or even challenged in that time frame and as a result has strongly influenced American policy and strategy; America and her allies rely heavily on a presumed dominance of the sea domain to facilitate operations of all kinds. Modern A2AD strategies, though they generally do not seek to achieve full sea control, do seek sea denial as their own cornerstone of power projection. Denying one's opponent use of sea lanes seriously inhibits the ability to build up combat power and sustain forces, a basic tenet of any A2AD concept. Though American dominance of the high seas appears largely intact, naval operations at ranges closer to the shores of capable opponents face significant threat capabilities. America has always relied on her Navy to keep her shores, and the shores of her allies, safe from seaborne invasion. She has also relied on her Navy to keep commercial sea lanes open and secure. If the Navy is unable to perform these missions without risking catastrophic casualties or the loss of expensive and rare surface ships, what other means are available that might serve to augment American naval power?

Contemporary surface ships of U.S. Navy rely heavily on the ASCM as their means of engaging surface vessels. These ships utilize a robust on-board sensor suite, integrated with numerous other sensors throughout all domains to detect surface targets, then engage and defeat them with missile fire. The ship, in this case, serves two primary functions: 1) the integrator and processor of targeting data, and 2) the launcher of a missile. Both of these functions can be performed on a shore-based platform. While such a platform has some significant limitations, it also offers some intriguing advantages to commanders.

Tactical advantages

Flexibility. The ability to deny hostile forces the use of key waterways adjacent to land masses without committing naval assets gives the commander options when deploying his or her forces. In example, defense of lower priority littoral areas or land masses might be left to land-based forces, freeing up low-density naval assets to conduct higher priority missions. Alternatively, land-based forces might augment naval forces in critical areas providing additional sensors and magazine depth to naval forces. Perhaps most importantly, effective deployment of land-based launchers might allow a degree of sea denial/control to remain in place in the event naval assets are forced to withdraw outside of the range of precision weapons or from mined areas, likely during the initial/high intensity phases of an A2AD campaign.

Observability/hardening. Ships are highly observable targets. They generally have large visual, radar, and electronic signatures which are difficult to reduce or conceal. They are also relatively vulnerable when compared with hardened land facilities. Shore-based launchers are a fraction of the size of a ship and can be easily concealed from most forms of observation by existing camouflage techniques. They can also be moved quickly to hardened facilities better able to withstand impacts from precision weapons, and can be moved quickly to defeat ISR attempts and avoid attack.

Operational advantages

Sustainment. Generally speaking, U.S. Navy ships must return to port in order to replenish their magazines. While replenishing, they are "off the line," which means that their mission must either be backfilled or not performed while they are taking on provisions. In contrast, land-based launchers can be resupplied without interrupting the unit's operations. If High Mobility Artillery Rocket Launcher (HIMARS) reload is thought of as analogous to reloading an Anti-ship Cruise Missile (ASCM) launcher, reload time can be as short as five minutes. Additionally, if anti-ship Fires are provided by shorebased launchers, the finite number of vertical launch cells each ship employs can be allocated to more aerial interceptors and land attack weapons, enhancing magazine depth for ships against critical targets.

Cost. Land-based launchers are relatively inexpensive. The cost of an individual launcher is likely in the \$2-3 million range (based on the present day HIMARS launcher). This is in contrast

to the \$1.7 billion cost of a new Arleigh Burke-class DDG, the \$360 million cost of an Independence-class LCS, or the \$130 million cost of an F-35C. Shorebased launchers are far more expendable and replaceable than expensive and rare surface ships or fifth generation fighter aircraft, which dramatically changes the risk profile for commanders when considering unit deployments.

Risk to service members. Unlike ships and aircraft, launchers and sensors can be operated remotely. Land-based system operators can work from within the confines of a hardened and minimally observable command post. This also changes the risk profile for commanders: instead of risking the life of a pilot or the over 300 members of an Arleigh Burke-class DDG to deliver anti-ship Fires, the destruction of a remotely operated anti-ship battery puts lives at minimal risk.

Strategic advantages

- Simple acquisition. Shore-based ASCM platforms are not new; in fact, several allied and rival nations already utilize similar technologies including the Japanese Type 88 and the Russian K-300P. The U.S. already fields capable ASCMs employed from surface vessels against surface targets, so the munitions for such a launcher already exist. In addition, U.S. Navy ASCMs have very similar dimensions to Patriot Advanced Capabilities 2 family interceptors and Multiple Launch Rocket System rockets, so adapting current launch systems may be a simple and inexpensive process. Additionally, Patriot, Sentinel or Q-53 radars may be adaptable to surface search roles through relatively simple software upgrades. The U.S. Navy already excels at over-the-horizon (OTH) targeting of their ASCMs; integrating into this construct will further enable the critical ISR of targeting with ASCMs. In short, a shore-to-ship capability can be achieved almost entirely through existing systems and infrastructure, which minimizes acquisition cost and timelines.
- **Forward presence.** Deploying a sea control/sea denial capability shows a commitment to maintaining the territorial integrity of multinational partners. Though naval surface vessels are undeniable symbols of power, support and reassurance for allies, they cannot

remain on-station indefinitely. Once they are deployed and emplaced, landbased forces are inherently simpler and cheaper to maintain in forward-deployed positions than are naval forces. This offers significant advantages when building long-term relationships with multinational partners. Finally, as they are primarily a defensive weapon, landbased ASCM launchers are minimally provocative when compared with other forms of power projection. This allows the U.S. and her allies to effectively build a regional deterrent capability while minimizing escalation.

Minimal force structure changes. An ASCM-capable launcher can be easily integrated into current air defense artillery or field artillery brigades, or in the future, into integrated Fires brigades. Both of these formations have the joint integration and mission command functions necessary to employ OTH munitions, both have institutional knowledge on how to deploy and sustain launchers, and both are experienced in integrating with joint and coalition partners. In the long term, a surface-launched land attack cruise missile capability employed by a Fires brigade might provide long-range strike capabilities against both maritime and land targets, employed by a unit that is simultaneously conducting an air and missile defense mission. In the event other shore-to-ship capabilities are developed (such as anti-ship ballistic missiles, electro-magnetic guns, or directed energy platforms), integration into the Fires brigade will be simple if a land-based ASCM capability is already fielded.

Limitations

- **Partner nation participation.** Unless such units are defending American shores, any land-based anti-ship capability requires close cooperation with partner nations for effective deployment. While such a capability might be seen as desirable to a nation under threat, other nations wishing to remain neutral or uninvolved in a given conflict may deny use of their territory. This in turn limits the areas in which shorebased anti-ship Fires can participate.
- Limited range. Unlike ships, landbased launchers are obviously limited by the size of land area on which they operate. This means that they can only deny or control sea areas that are with-

in the range of their munitions and ISR capabilities. This limitation highlights the cooperative joint nature of such a capability; a shore-based anti-ship system is not a singular solution, rather, a complementary one.

Requirements for a shore-to-ship system

Multi-spectrum, integrated ISR. Even the best munition can be rendered nearly useless if it is not targeted quickly and accurately. Conversely, superior targeting can make even mediocre munitions very dangerous. Sensors must deliver targeting data in near real-time to enable precision Fires across all domains, to include shoreto-ship Fires. Shore-based anti-ship Fires are uniquely dependent on high quality ISR as their targets are typically over the horizon and also in motion. A key enabler of OTH targeting is the elevated sensor: Joint Land Attack Cruise Missile Defense Elevated Netted Sensor System, airborne (i.e., P-8 Poseidon, MQ-4C Triton), and satellites are examples. Another key enabler is full spectrum detection: a mix of capabilities that detects targets using a variety of sensor inputs (visual, electronic, radio frequency, infrared, cyber) is far more difficult to defeat. All detection capabilities must be integrated effectively and then moved quickly to the fire control element: maritime surface targets are dynamic and in motion, so any delays in promulgating targeting data may result in loss of the target.

Integrated fire control

Integration with joint and coalition partners is a critical enabler of a shore-toship capability. The most effective maritime surface sensors belong to the Navy; these must be effectively leveraged in order to maximize the effectiveness of any anti-ship system. Integrated fire control is more than this, however. Integrated fire control allows platforms to engage targets using munitions from other platforms. In this case, a Navy ship might utilize a shore-based launcher's missile to engage a target that it has detected. This preserves the ship's onboard magazine and dramatically enhances the area that the shore-based battery can service.

Mobility, survivability and sustainability

Suppressing launchers and sensors of all types will be among the highest priority missions during the initial phases of an A2AD campaign. Since it is unlikely that the U.S. and her allies will successfully meet such an attack head-on, survivability of high-priority targets in the face of direct attack is very important. Land-based launchers will be in a mobile erector launcher or transporter erector launcher configuration and must have minimal emplacement and displacement times, allowing them to deploy rapidly from concealed and hardened areas, fire their munitions and then retreat again to safety. This "shoot-and-scoot" approach has proved very successful in past conflicts, allowing valuable launchers to survive even when large numbers of hostile forces are dedicated directly to their suppression. Ground-based sensors are more difficult to conceal, harden and move, highlighting the advantages offered by integrating ISR and fire control. Sustainability is also critical: Class V supplies in particular are expensive, bulky and fragile thus making their movement over long distances problematic, especially when under fire. Prepositioned stocks are a major enabler. In addition, sustainment of sensors and launchers in distant locations has proved challenging for Fires forces; processes for conducting sustainment over wide areas must be practiced and enhanced

Possible materiel solutions for a shore-toship capability

Near term (2020). A possible solution in the near term utilizes systems currently fielded systems integrated with existing ISR and fire control constructs to provide a rapidly fielded, inexpensive solution. The GM-84 Harpoon or the forthcoming Long Range Anti-Ship Missile, which is mounted on a High Mobility Artillery Rocket System or Patriot launcher, controlled by the ADA Engagement Operation Center or the FA battery command post. Local sensor coverage is provided by a repurposed Sentinel or Q-53 radars. The unit must have at least some integration to coordinate and clear Fires with the U.S. Navy's surveillance and fire control networks, though full digital integration and IFC are likely not achievable in the near term.

Midterm (2030). The primary advancement in the mid-term is the enhanced integration between the shore-based battery and joint partners. In this time frame, integrated fire control for AMD Fires will become a reality; shore-to-ship Fires must pursue a similar construct. Real-time digital connections enable rapid dissemination of fire control orders, fully fused sensor networks provide a common operational picture to commanders and operators. During this time frame it is possible that new platforms and munitions are fielded as well: loitering, home-on-jam, autonomous target recognition and low observable are a few possibilities. Additionally, anti-ship ballistic missiles may be fielded during this time frame, possibly using long-range precision Fires as the basis. Anti-ship ballistic missiles (ASBMs) provide enhanced range and greater penetration capability, allowing engagements at standoff ranges versus challenging targets. During this time frame, dual-purpose land-attack/anti-ship cruise missiles may be employed by these batteries, adding a significant land-based strike capability.

Long Term (2040). In this time frame, ASCMs/BMs are employed simultaneously by firing units conducting AMD missions and fire support missions. Multi-mission components are the backbone of these units: launchers that can transport and deliver munitions of all types, and fire control elements that can simultaneously conduct AMD and fire support missions, and sensors that can simultaneously detect targets of all types on the ground and in the air. Fire control is fully integrated: munitions of all types are indifferent to their launching platform, they use shared targeting data promulgated over networks instead of unitary downlinks to their firing battery. New delivery technologies such as directed energy or electromagnetic launch are fielded as well; these capabilities are employed against both air and surface targets, both maritime and on land.

Conclusion

The projected operational environment places many challenges on Army and joint forces: highly capable potential opponents, new strategies to counter U.S. power projection, and fiscal austerity foremost among them. No longer will the U.S. be assured of dominance in the maritime and air domain, and no longer will the U.S. enjoy unfettered buildup of combat power before taking on geographically distant opponents. When seeking new solutions to overcome issues of sufficiency and capability, asymmetric approaches are now a necessity. Shore-toship Fires, though less capable outright than their sea or air counterparts, show potential as an inexpensive, replaceable and survivable complement to traditional platforms of naval power. It offers a useful option to commanders seeking new ways to create overmatch and it represents an opportunity to further integrate Army and Navy Fires

into a truly joint construct. Finally, it represents a strong developmental opportunity for Army Fires, giving the warfighting function its first true cross-domain capability.

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TRADOC Big 6+1 Capabilities

By Lt. Col. Corey B. Chassé

Over the last 15 years of combat operations, the U.S. Army has focused on winning against irregular adversaries and overcoming challenges in Iraq and Afghanistan. This remains the focus and has limited the Army's capability to modernize for future fights. Meanwhile, enemies rapidly modernize and have become increasingly capable. These conditions point to an emerging security environment in which U.S. ground forces are likely to face tactical overmatch (meaning to be more than a match for; surpass; defeat) in some operations.

In addition, decreases to the Army's overall budget compound the challenges of modernization. Compared to the last two drawdowns of the Army (Post Vietnam and post-Cold War), not only has the Army taken a larger percentage cut than previously, but those drawdowns came after the Army had already modernized much of the force. As a result of increasing enemy capabilities and the reduction in resources available for modernization, Soldiers and mission are at unacceptable risk that may continue to increase.

Capabilities overview

To effectively meet the operational challenges and emerging threats in 2030, the Army must develop future capabilities to include the ability to operate freely in the electromagnetic spectrum. That means maintaining secure, reliable communications and accurate position, navigation and timing capabilities. The Army must develop advanced protection systems to defend ground platforms. Conversely, to defeat progressively more technologically advanced threat protective systems, the Army must be prepared to advance the capabilities and employment of directed energy weapons along with enhanced conventional capabilities. Future Army forces will project power by applying cross-domain capabilities from land to create synergy across all domains, ensuring joint force freedom of movement and action. In addition to working throughout multiple domains, the Army will have to develop effective capabilities to protect friendly forces, information, and systems; detect adversary threats; react to indications and warning and restore capabilities when challenged by adversary systems or tactics.

The Army has identified key capabilities and systems which require senior leader oversight to increase the chances of successful delivery of capabilities. The Training and Doctrine Command Big 6+1 Capabilities identified do not represent all of the capabilities required for our Army, but focus on those that allow the Army to close critical capability gaps and fight in the context of the Army Operating Concept (AOC). In addition, these capabilities provide a framework to enable the Army to focus future force development and prioritize research, development and acquisition activities.

TRADOC Big 6+1 Capabilities

- a. Future vertical lift
- b. Combat vehicles

- c. Cross domain Fires
- d. Advanced protection
- e. Expeditionary mission command/cyber electromagnetic
- f. Robotics and autonomous systems (RAS) with a cross-cutting capability of Plus 1
- g. Soldier and team performance and overmatch

The Army recognizes that there is no "silver bullet" technological solution. The Army retains overmatch by combining technologies and integrating them into changes in organizations, doctrine, leader development, training and personnel policies. The Plus 1, or cross-cutting capability of Soldier and team performance and overmatch, requires that focus be placed on fundamental capabilities that empower the Soldier. The Army must fit machines to Soldiers rather than the other way around. The Army will pursue advances in human sciences for cognitive, social and physical development and emphasize engineering psychology and human factors engineering in the design of weapons and equipment as well as training and leader development activities.

Way ahead

TRADOC will continue to refine these capabilities using the think, learn, analyze, implement paradigm. Army leaders must think clearly about future armed conflict by considering threats, enemies and adversaries; anticipated missions; emerging technologies; historical observations and lessons learned; and opportunities to use existing capabilities in new ways. Army leaders then learn about the future through Force 2025 Maneuvers - the physical and intellectual activities to develop interim solutions to Army War Fighting Challenges (AWFC) first codified in the AOC. The Army then analyzes these solutions to establish risk-based priorities and identifies opportunities to ensure Army formations have the capability and capacity to accomplish assigned missions. This analysis supports senior leader decision for the implement step to deliver AWFC interim solutions that improve the combat effectiveness of the current and future force. You can reference the AOC at http:// tradoc.army.mil/tpubs/pams/TP525-3-1.pdf.

To ensure these capabilities are delivered to support the Army's future force, they require intense Army senior leader visibility and oversight. TRADOC will work with Department of the Army Head-quarters in developing the specific management practices for the TRADOC Big 6+1 Capabilities identified systems.

Multi domain battlefield video (must have CAC access): https:// www.us.army.mil/suite/doc/47289745

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