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SURFACE SHIP OPERATIONS IN THE LITTORAL: ENSURING ACCESS

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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Ensuring access will require U.S. forces to incorporate Operational Maneuver from the Sea in consonance with realistic training and technological development. Building effective littoral warfare methodologies is an evolutionary process and will take time, but ensuring access is not an insurmountable task.

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Introduction

The end of the Cold War and the dissolution of the Former Soviet Union wrought some profound changes in maritime strategy and doctrine. This fundamental shift from a navy designed to engage an opposing blue-water battle fleet (postulated in the 1986 U.S. Maritime Strategy) to one focused on forward operations in the littoral was necessary to support forward presence and crisis response missions articulated in the U.S. National Security Strategy (NSS).[1] These missions were further developed in the National Military Strategy (NMS), which specifies presence and power projection as just two of the strategic concepts intended to shape the peacetime environment.[2]

The U.S. Navy white papers "...From the Sea" and "Forward...from the Sea, along with the U.S. Marine Corps concept paper "Operational Maneuver from the Sea" (OMFTS), advance these aforementioned concepts but do not address the vital issue of ensuring access to littoral areas in a non-permissive environment. There are several Naval Warfare Publications (NWPs) that discuss littoral operations and coastal warfare in broad terms, but the closest approach to the question of access is a somewhat disappointing phrase in NWP 3-20.6 (Surface Ship Tactical Employment in Naval Warfare) that states, "Mastery of the littoral should not be presumed. It does not derive directly from command of the high seas. It requires focused skill and resources."[3] Similarly, there are no Joint publications or tactics, techniques and procedures (TTP) that discuss the issue of ensuring access to the littoral battlespace.

This paper examines the thorny issue of ensuring access against a potential aggressor employing sea denial strategies. Ensuring access requires continued development in three core areas – OMFTS (and TTP to support the operational concept),

realistic training (including modeling and simulation), and technological innovation. I will develop this thesis by addressing the unique challenges of the littoral environment, predominant threats, and how OMFTS, training, and technology can be harnessed to ensure continued access to the littoral battlespace.

The Littoral Environment

Historically, there is nothing new about operating in coastal waters. Indeed, the U.S. Navy has been doing so since its inception. During the Cold War, our maritime strategy specifically stated that U.S. and NATO maritime forces were to counter the Soviet Navy at sea, but they were also tasked to "support campaigns in ground theaters both directly and indirectly."[4] Indeed, between 1946 and 1990, U.S. naval forces were the sole or principal element in over 250 U.S. and Joint operations.[5] Today, the requirement to operate in the littorals is necessary to accomplish the fundamental mission of power projection ashore, but it still does not obviate our need to maintain a blue-water capability. These two basic requirements are not necessarily mutually supportive because of the unique challenges posed by the littoral environment.

Although the littoral represents a relatively small portion of the world's surface, it is home to over three-quarters of the world's population, contains 80% of world capitals, and virtually all marketplaces for international trade.[6] As such, perhaps the greatest challenge presented by this environment is the staggering number of surface and air contacts in a congested area – all of which must be sorted out to determine friend, enemy and neutral. Operational factors of space and time are necessarily compressed by the sheer proximity of land to maritime operations. Other factors that must be considered include geography, oceanography and climate.

Consider a surface combatant's reaction time to engage a typical sub-sonic anti-ship cruise missile detected at the radar horizon. Traveling at Mach 0.85, assuming initial detection at 12 miles, gives an operator approximately 40 seconds to engage prior to impact. Of course, that assumes a clutter free environment, proper track initiation and a whole host of other combat system minutiae immaterial to this discussion. Suffice to say that this is a challenging problem even in a blue-water environment for our most capable ships. Add the congestion and confusion presented to systems and operators in the littoral and you have a challenge indeed.

Typical geography in this environment may feature highly indented coasts dotted with small islands, along with many innumerable bays and inlets, restricting ship maneuverability and hampering maritime reconnaissance. There may be numerous shoals, reefs, and strong currents that further compress the battle space.

Oceanography in the littoral clearly influences combat force employment. Shallow water, unique bottom topography, temperature inversions, variations in salinity due to fresh water runoff from rivers, high sound reverberation, and unique propagation paths all combine to make undersea warfare a risky business.

Similarly, climate and the combined effect of air temperature close to land can create unique atmospheric ducting that plays havoc with everything from communications to missile engagements. Cloudiness, rain, or fog can significantly reduce visibility on the sea surface and restrict flight operations or reconnaissance patrols.

Singularly, these factors may be relatively benign, but their combined effects in an environment already cluttered with all manner of vehicular contacts can be of the utmost

benefit to a hostile force bent on denying access to maritime forces. An imaginative and resourceful adversary can present several threats that will each be examined in turn.

Predominant Threats

Predominant threats (in order of increasing difficulty) that any maritime force can expect to face in the littoral include coastal defenses, fast patrol boats, small diesel submarines, mines, and integrated littoral defenses. I specifically order them in this way to demonstrate our relative engagement capability against these threats, or to put it more simply, what can we do about them? Of these, the most challenging are the last three, primarily because they are effective access denial strategies and detection is difficult as well as time consuming.

Coastal Defenses

Coastal defenses consist essentially of gun and missile batteries. Of these, gun batteries have been used for many years with mixed results; as such, their numbers are steadily diminishing. Missile batteries feature greater utility and lethality, can be fixed or mobile, and come in anti-air and anti-ship versions. Today, approximately 76 countries have either gun or missile batteries, or both. Among anti-ship cruise missiles, the top three sellers are Exocet, Styx, and Harpoon.[7] Other notables include C-801, CSS-N-1, and SS-N-22. The greatest advantage of these weapons is their speed to the target and lethality once they arrive. Fixed sites can be vulnerable to targeting, but mobile sites are especially difficult. Moreover, these missiles can be extremely difficult to detect and engage in a high clutter environment. Of all the potential threats however, this is relatively low for three reasons. First, maritime forces will use air power to destroy fixed sites and employ time sensitive targeting methods for mobile ones. Second, most of these

missiles require some form of targeting data that must be provided from either a ship, helicopter, aircraft, or electronic cross fixing. Typically, effective targeting has not been very good among so called Rest of the World (ROW) forces. Last, and most importantly, missile defense is one of the U.S. Navy's critical strengths and surface combatants practice hard and soft kill techniques regularly. Generally, if something can be detected, it can be engaged. Notwithstanding the land-sea radar interface and high-density contact environment, any inbound missile will have high Doppler in relation to background contacts and should be detected.

Fast Patrol Boats

Fast Patrol Boats (FPBs) are uniquely suited to littoral operations and are capable of carrying surface-to-surface (SSM) and surface-to-air missiles (SAM). There are approximately 54 nations worldwide whose small boats carry 20 different models of SSMs; Exocet again being the most prevalent.[8] Most FPBs are built specifically for surface warfare, but variants can also conduct undersea and mine warfare. Carrying essentially the same types of weapons as frigates and destroyers, their lethality often matches that of much larger ships. Some feature sophisticated equipment including low light television, infrared, laser systems, data links, and low observable technology. Their primary strength lies in remaining undetected in high radar clutter areas such as gulfs, islands, friendly harbors, and shoal water. Shallow draft permits their unrestricted movement in and around reefs, and some have even been known to operate in minefields.[9] Often, their operating environment is limited only by the senior officer's degree of imagination and daring. Such attractive attributes make FPBs challenging

adversaries for large surface combatants, but these small boats also have critical vulnerabilities that can be exploited.

Chief among these are limited operational radius, relatively high fuel consumption, and vulnerability to attack during daylight. Small size can also be a limitation in certain sea states as effective weapons control and targeting will be severely degraded as seas get heavier. As in many small unit actions, the boats' effectiveness will be directly proportionate to their level of material readiness and the crews' level of training. Most ROW countries have not demonstrated the capacity to adequately maintain or sustain their FPB fleets. The best platform to counter the FPB threat is situationally dependent, but generally, fixed wing or armed helicopters are the most devastating to small boats. FPBs, once engaged, usually are either completely destroyed or end as mission kills because of their small size. Experiences in Operation EARNEST WILL demonstrated that alerted maritime forces with organic air power could neutralize a seemingly potent FPB threat.

Diesel Submarines

Many navies operate diesel submarines (SS), including 21 ROW countries.[10] Although the actual number of SSs worldwide is decreasing, the threat is growing because of steadily improving technology. Germany is the leading world exporter of its Type 209 SS, having sold this model over the past twenty years to such countries as Argentina, Indonesia, and Brazil. Diesel boats are small, fairly quiet, inherently stealthy, and for oceanographic reasons mentioned earlier, clearly enjoy a significant advantage in the littoral. They typically have a submerged endurance of six days, capable of traveling nearly 1,000 miles at six knots on battery. Some newer diesel boats now have air-

independent propulsion (AIP) systems that permit low-speed cruising for more than 10 days without snorkeling. All boats carry torpedoes; some can lay mines.

Diesel submarines pose a significant threat to maritime forces in the littoral, but not an insurmountable one. Many of the same limitations that apply to FPBs are especially true for submarines, perhaps more so. Recent experience has proven that most ROW nations do not have the logistic resources to properly maintain even one or two diesel boats. As a result, many are non-operational or only sortie once a month past the breakwater and then return. Often they will not venture beyond sight of their tender in case they suffer a catastrophic failure. Indeed, many of these boats have exceeded their service life and are unsafe to sail.

Even if a potential adversary had completely reliable submarines with well-trained, fearless crews, water depth and bottom topography can work to their disadvantage. Even a small diesel boat still requires at least 35-45 feet of water to safely submerge. Allowing for a safety margin and added depth to avoid air detection, it will need a minimal water depth of between 105-120 feet. This knowledge alone can be helpful in determining where the submarine cannot physically be. If other features of bottom topography are known, it may also be possible to make some intelligent assessments about the most likely and most dangerous locations for a submarine.

Once the most likely locations for an enemy submarine have been determined, aggressive hold down tactics by maritime reconnaissance aircraft including radar flood can buy enough time to neutralize the threat. Clearly, an unlocated diesel boat is going to pose significant problems, but maritime forces still have some degree of options available with which to counter.

Mines

Over 150 types of naval mines exist in the worldwide inventory of approximately 50 countries.[11] Today more than 30 countries develop, manufacture, and market mines for global customers. Since their invention in the nineteenth century, they have proven to be the poor man's weapon of choice. They are inexpensive to produce, easy to use, and can be placed by a wide variety of platforms, including submarines, surface combatants, aircraft, merchant ships, or virtually anything that floats with a motor. There is no maintenance to worry about; no issues of seaworthiness or crew training proficiency. Politically, mines are viewed as being essentially defensive, but their effect can be devastating. Mines produced today are nothing like those just 10 years ago. Modern mines incorporate digital signal processors, sophisticated target acquisition programs, and magnetic signature recording capability. For these reasons, simple minesweeping is no longer adequate; minehunting is required to locate and destroy individual mines. Perhaps an even harder problem is the issue of mines in very shallow water (VSW) and the surf zone (SZ). There is currently no method that has been developed that can effectively defeat a VSW/SW minefield.[12]

Regrettably, the U.S. Navy's capability in mine warfare is only marginally better than it was in the Gulf War, which is to say that it is extremely limited and requires significant lead time to deploy assets. Once in theater, effective minehunting simply takes time and there is no way to expedite the physical limitations of minehunting. Of all possible threats, mines represent the most formidable challenge to operating in the littoral simply because our assets and capabilities are insufficient to readily dispose of the threat.

Integrated Littoral Defenses

Integrated defenses occupy the highest rung of the relative threat ladder and are truly worth more than the sum of their individual parts. Regardless of how manageable an individual FPB or submarine threat may be, the cumulative effect of an integrated defense-in-depth makes virtually any adversary a formidable opponent. A typical arrangement might include an outer submarine picket, perhaps deployed in a choke point or along a known transit area. The next inner layer could be a combination of coordinated air force attacks (in time, or in waves) with coastal missile batteries (60-150 miles from the coast) intended to saturate U.S. defenses or specifically target portions of the force. The innermost layer would be one or more minefields under the umbrella of fixed wing aircraft, coastal missile batteries, and FPBs, designed specifically to impede any attempts at mine clearance.

One possible counter to an integrated defense is to attack the seams – that is, attack the enemy's data links and coordination nets. While U.S. forces are good at this, the archetypal ROW adversary may not have many data links to jam. Whatever integrated defense exists is likely to be based on previously agreed plans and standard operating procedures rather than a sophisticated communication system.

Ensuring Access – The Way Ahead

Presented with these seemingly impenetrable arrays of littoral defenses, it is imperative that the U.S. Navy develops methods to counter this threat to remain a credible force option and to fulfill the tenets elucidated in the NSS and NMS.

Ensuring access against a determined adversary employing sea denial strategies will not be easy, but it is hardly impossible. The principles inherent in OMFTS point the way

ahead and, combined with realistic training and technological development, offer the greatest potential for arriving at a viable solution. All three efforts must proceed in parallel and all three are interdependent.

Operational Maneuver from the Sea

OMFTS is as much a mindset as a methodology for conducting operations in the littoral. It espouses maneuver of naval forces at the operational level to exploit significant enemy weaknesses. At first glance, there does not seem to be anything revolutionary in this concept. After all, naval forces have really always been maneuver oriented and naval warfare itself tends to be non-linear. What distinguishes OMFTS from all other brands of maneuver warfare is its synergistic use of other supporting elements including ship-to-objective maneuver (STOM), information operations (IO), intelligence, command and control, and sea based logistics.

STOM, once fully developed, will enable forces to move directly into the objective, bypassing build-up ashore and allowing our forces to remain over the horizon.[13] From this posture, we can significantly reduce our vulnerability to virtually all littoral threats described earlier. Additionally, this added flexibility would maximize surprise and speed while forcing the enemy to disperse his forces in a futile attempt to defend through the depth of his battlespace.

STOM certainly should not be considered a panacea for two significant reasons. First, we're not there yet. We have not yet fully developed the technology that will support it. More importantly, regardless of our eventual capability, there will always be a point at which maneuver elements transition from waterborne movement to land – the littoral penetration point (LPP).[14] It is at this point that forces will be most vulnerable.

This can be mitigated somewhat by attacking multiple LPPs along several axes using surface and vertical envelopment. Another option is to penetrate the enemy coast outside his defenses and then attack back into the vital area.

Information operations will be a pivotal element in OMFTS as we seek to confuse and disorient the enemy in an effort to compel him to shift resources away from our main effort. In OMFTS, deception and ambiguity becomes vitally important as they give U.S. forces the capability to use overwhelming speed and operational tempo to either fix enemy forces or exploit gaps in their defenses. Perhaps the most notable recent example was the Marine amphibious demonstration off the Kuwaiti coast during the Gulf War. Its thoroughness and a known U.S. expertise in amphibious assault compelled Saddam Hussein to allocate a portion of Iraqi forces in the south and east to protect against just such a possibility.

Intelligence will also be essential in the high tempo operations characteristic of OMFTS. Beyond merely assessing enemy order of battle and force dispositions, intelligence specialists will have to provide commanders with timely, accurate appraisals of how the enemy is reacting to our plan. Only through constant evaluation will we be able to effectively exploit enemy weaknesses in a dynamic environment.

Throughout the battlespace, effective command and control; specifically command, control, communications, computers, and intelligence (C4ISR) will be the linchpin for successful littoral operations. The multi-dimensional warfare arena in the littoral makes this venue inherently Joint, and demands that we have a robust C4ISR capability to maximize our capabilities. We need to focus on inter and intra-service interoperability and surveillance data dissemination. Not only must commanders have a common

operational picture in order to make informed decisions, operators at the tactical level will need one to accept remote target designations and to view the integrated battlespace around them. Improved awareness will lead to increased ability to take effective action immediately. Accurate surveillance and reconnaissance will also be essential in planning and combat operations. Network centric operations in netted sensor environments will further expedite our decision loops and force the enemy into a reactive mode.

Sea based logistics will ultimately make OMFTS and STOM a reality. Once fully implemented, it will eliminate the need for large beachhead logistic consolidation, which has historically been the focus for amphibious operations. Ship to objective logistics (STOL) will become the supply methodology akin to STOM. More importantly, STOL will sustain the force from the sea, reduce the logistic footprint ashore and allow end users to pull tailored support to maneuver units.[15] The ultimate goal will be to achieve total asset visibility to all customers that will further streamline sustainment response. Future operational capabilities will include selective offload, strategic logistics interface, sea based intermediate maintenance, and Joint interoperability.

Sustaining deeply inserted vertical assault forces and rapidly penetrating surface assault forces from a sea base presents a critical challenge. Without sea based logistics, OMFTS and effective littoral operations will be hard to conduct.

OMFTS, STOM, IO, intelligence, command and control, and sea based logistics all combine to produce one element of an effective methodology to ensure access to the littoral battlespace in a non-permissive environment. TTP to support the operational concept will necessarily be evolutionary as we explore littoral operations through realistic

training, using modeling and simulation (M&S), as well as thoughtful, innovative at-sea exercises.

Realistic Training

Realistic training is the foundation to successful operations in any environment. Fundamentally, training serves to reinforce learned behavior and to build confidence in the ability to execute missions of varying difficulty. Warfare in the littoral demands that tactical maneuver unit commanders must be prepared to direct STOM from attack positions beyond the horizon all the way to objectives well inland. Moreover, they will have to coordinate movement with higher headquarters and adjacent units, call for fire, and make rapid decisions to achieve the commander's intent. In this new environment, modeling and simulation can play a large role in helping develop realistic training scenarios.

M&S is a dynamic growth industry in both the civilian world and the military. Its power is the ability to show operational impact, visualize interactions, and depict alternatives before committing further resources in material development. The Coastal Warfare Evaluation Systems (CWES) office within Naval Sea Systems Command (NAVSEA) provides end-to-end simulation support to meet analysis, training, and acquisition needs for the littoral warfare community, including mine countermeasures, minefield operations and planning, amphibious assaults, naval fires support, and naval special warfare.[16] CWES sponsors include the Naval War College, Office of Naval Research, Defense Modeling and Simulation Office, Communication and Electronics Command, Expeditionary Warfare Training Group Pacific, Headquarters Marine Corps, and the Space and Naval Warfare Systems Command.

Some CWES products include the Total Mine Simulation System (TMSS), which models interactions between mine threats and sweep systems, the Surf Zone Mine Clearance Analysis Tool (SZMCAT), which models the effectiveness of explosive systems against mines in the VSW/SZ regime, and the Shallow Water Acoustic Toolset (SWAT), which models the interaction between the environment, target, and sonar in VSW applications.[17]

The value of M&S cannot be overemphasized in today's climate of fiscal constraint. As systems grow in complexity and cost, M&S will become critical to exposing and correcting significant problems prior to field use.

Another training dimension that we should be exploiting is utilizing the corporate body of littoral warfare expertise that exists in many of Allied navies. We need to incorporate their experiences in our training regimes across our entire organizational and operational spectrum; from fleet staffs to individual units, from initial schoolhouse training to complex exercise planning. Much as we analyze prior military campaigns to broaden our operational experience, we must apply the same analytic process in exposing our young and not so young naval officers to those who have been operating in the littoral for their entire career.

The ultimate expression of realistic training is usually achieved in at-sea exercises, and for naval forces, that usually means the Joint Task Force Exercise (JTFEX). This "final exam" certifies carrier battle groups for deployment and is the culmination of a long training cycle spanning 18 months. JTFEX may fulfill its mission as a certifying methodology, and it certainly exercises staffs and warfare commanders in large operations, but for exercising ships in littoral warfare, it is a poor model. Littoral warfare

is much more than conducting Maritime Interception Operations (MIO). It is much harder than plotting synthetic geography that one must avoid on a chart.

One possible solution is to incorporate short duration (three day) "littoral warfare exercises" (LWX) frequently throughout the training cycle (perhaps bi-monthly) while the ship is already underway for other commitments. Unlike JTFEXs, their primary function would be to present as realistic a littoral warfare environment as possible, as such, they would be much smaller in scope, not involving Joint participation, or the full scale of the "battle rhythm" process replete with video-teleconferencing and the plethora of coordination meetings. These processes get worked during JTFEX. The focus of LWX would be to get to the basics of operating in the littoral and to stress our crews and their leadership in innovative ways.

To be sure, specifics would need to be worked regarding air space control issues, oparea clearance, and operations close to land, but the training benefit would be enormous. By the time the battle group came together for JTFEX, individual ships would have completed approximately five of these LWXs and would certainly have a greater understanding of the challenges of littoral warfare. How many ship COs today can say they are truly comfortable with their junior officers' tactical shiphandling proficiency in restricted waters? The sad fact is that we just don't practice often enough.

In the end, what we're really trying to accomplish is nothing less than producing leaders from the small unit level all the way up to the fleet staffs, who have the requisite experience and knowledge to make critical decisions in an uncertain environment. In the dynamic littoral environment, we must have people who can make correct decisions

quickly on an intuitive basis. These skills can only be forged through the wide application of all available resources and innovative training techniques.

Technological Development

Technological innovation is the foundation behind all the access assurance strategies previously discussed. Technology will enable operational concepts such as OMFTS and STOM to become reality. Although the U.S. is clearly dominant in C4ISR, other areas such as mine countermeasures are sorely lacking. Furthermore, all technological development takes time and is subject to a ponderous acquisition process that could easily be the subject of another discussion. The vast landscape of technological innovation in the littoral arena greatly exceeds the scope of this discussion, but for our purposes, some of the technology supporting OMFTS, C4ISR, and mine countermeasures will be addressed.

OMFTS requires a medium-lift aircraft to replace the Marine Corps' aging fleet of CH-46E and CH-53D helicopters. The highly controversial MV-22 program is designed to do just that, but recent setbacks could delay the originally planned FY 2001 initial operational capability (IOC). Total planned procurement is 360 for the Marine Corps.

The Land-Attack Destroyer (DD-21) is a surface platform specifically designed to support Joint service requirements in littoral regions.[18] DD-21 will provide sustained, offensive, and distributed firepower in support of forces ashore. Long-range fire support will be possible from the installation of the Advanced Gun System (AGS). AGS will be a fully integrated 155 mm gun weapon system that includes two 155 mm guns, each capable of independently firing up to 12 rounds per minute from an automated magazine storing as many as 1,500 rounds.[19]

Technological development in the C4ISR realm has been progressing at an astounding pace. There are 29 active programs that include Cooperative Engagement Capability (CEC), Naval Fires Control System (NFCS), Lightweight Super High Frequency (SHF) SATCOM, Joint Service Imagery Processing System (JSIPS), Global Command and Control System – Maritime (GCCS-M), Advanced Tactical Data Link Program (ATDL), and a host of others.[20]

Indeed, the plethora of C4ISR installs has led to configuration control problems at times. Every battle group deploys with some unique C4ISR capability of some kind, and every battle group has a master compilation of who's got what systems so everyone can keep track of the latest installations. There can be no doubt that U.S. C4ISR capabilities will be very robust in the future.

In stark contrast to the highly successful C4ISR program, there are only five active programs developing organic mine countermeasure systems and one program that address the VSW/SZ mine threat. Organic mine countermeasures include the Airborne Mine Neutralization System (AMNS), Assault Breaching Programs, Airborne Laser Mine Detection System (ALMDS), Remote Mine-hunting System (RMS), and Unmanned Underwater Vehicles (UUV). Of note, RMS was successfully tested in FY 1997 and will be installed in Arleigh Burke Flight IIA destroyers beginning with DDG 91 in FY 2003.

The sole initiative in VSW/SW mine neutralization started in 1997 with the first and only VSW Mine Countermeasure Detachment (VSW MCM DET). This unique organization was comprised of Explosive Ordnance Disposal (EOD) technicians, Naval Special Warfare divers (SEALS), Marine Corps Force Reconnaissance divers, and the MK 8 Marine Mammal System (more commonly known as Flipper). Their charter was

to develop TTP for MCM operations in the VSW/SZ and to develop the capability to rapidly mobilize and embark on deployed amphibious task groups during contingencies.

Conclusions

The preceding littoral analysis and proposed three-tier approach (OMFTS, realistic training, and technological innovation) to ensuring access is offered in support of existing operational concepts and technology prospects projected to be available within five to seven years.

While we seem to be headed in the right direction, the question of what happens if we are faced with an area denial strategy next month or next year is very compelling. Clearly, our most critical vulnerability today is mine countermeasures. Any potential adversary prepared to conduct defensive or offensive mining would be in a good position to thwart U.S. attempts at access. If the objective was deemed necessary, U.S. forces would undertake a Herculean effort to clear a path through any minefield, but it would take time and how costly would it be? The reality is that we will probably never achieve mine countermeasure forces in sufficient quantity to adequately neutralize the mine threat. If that is the case, our political leadership must resurrect the lost art of coercive diplomacy and use other instruments of national power to effectively dissuade potential adversaries from challenging us in this area.

Despite the challenges of operating in the littoral, it is not an insurmountable problem. Not too long ago, the U.S. Navy struggled with the technical and operational concerns regarding long-range anti-air warfare (LRAAW) with missiles in the 1950s. Within a decade, the U.S. Navy had written the book on LRAAW and was the recognized expert in blue-water battle group air defense. It would seem that we are at a similar

juncture now with littoral warfare. This will be an evolutionary process as we expand our body of knowledge and develop innovative solutions. It will certainly take time, but with the right focus and level of effort, the challenge of ensuring access will be overcome.

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[20] Ibid., 87-101.

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