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The Diesel-Electric Submarine Threat:

Ignore, Engage or Avoid?

By

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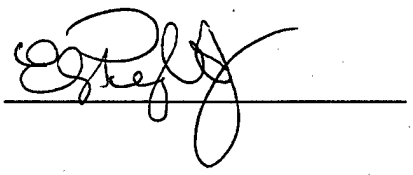
A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

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.

Signature: 

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Abstract

The diesel-electric submarine's proliferation on the global arms market presents a challenge to maritime component commanders supporting forward-deployed operations. There is a growing risk to regional CINCs that nations hostile to the United States will use their diesel-electric submarines for delaying and sea denial purposes. The negative affect of these actions on factor time will impact the efficient use of the operational factors of space and forces. Diesel-electric submarines can also attack operational and strategic centers of gravity.

The maritime component commanders must balance risk, resource demands and the impact on factor time to choose from one of three possible courses of action: (1) accept a high level of risk and ignore the threat, (2) lower the risk by engaging the threat or (3) minimize the risk by avoiding the submarines.

This paper recommends a "hold down" version of the "engagement" option, using joint and combined forces, as the best approach against the diesel-electric threat.

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Introduction

> The successful application of military power is dependent on uninhibited access to air and sea. Control of these mediums allows the United States to project power across great distances, conduct military operations, and protect our interests around the world.
>
> *National Military Strategy of the United States of America, 1997*[1]

As a maritime nation bound by national strategic aims of power projection and unrestricted access to the international seas, the United States faces many global challenges. One concern of particular relevance to the regional Commander's-in-Chief (CINCs) is the growing worldwide proliferation of diesel-electric submarines. These submarines can interfere with the CINCs' efforts to keep the international sea lanes within their areas of responsibility open to military and commercial shipping. Further, in a crisis requiring a major deployment of military forces, highly dependent on sea lift for build-up and sustainment, the delaying or sea denial capabilities of the diesel-electric submarine are tangible threats. Timeliness, a critical aspect of the CINCs' responsiveness to regional crises, can be seriously impeded. In today's expeditionary military operations, where CINCs are supported by troops deploying over vast distances, this time delay critically affects the other operational factors of space and forces.

The CINCs' maritime component commanders must plan on a course of action to meet the diesel-electric threat. There are three general choices: (1) accept a high level of risk and

ignore the threat, (2) lower the risk by engaging the threat or (3) minimize the risk by avoiding the submarines. To determine the best course of action this paper will weigh the resource demands and risks of each of these choices against their impact on one of the CINCs' crucial operational factors, time. The greatest impact of this threat on the other operational factors of space and forces are directly related to the time stealing potential of the diesel-electric submarines. Therefore, a solution which minimizes the negative effects on factor time will also contribute to the efficient use of space and forces. First, we will look at the widespread threat of the diesel-electric submarines.

The Threat

Submarine Proliferation

In the 1982 Falkland-Malvinas conflict, Argentina found itself up against the shrinking but still formidable British Royal Navy. Although not tactically successful, the Argentine diesel-electric submarine *San Luis,* a German-built Type-209, caused the British much operational consternation. The Royal Navy had to devote ships and aircraft to anti-submarine warfare duties, and had to maintain a safe standoff distance between their high value ships and the possible operating area of the *San*

Luis[*]. An international lesson was learned, as stated by Dr. Juan Carlos Murguizur of the Argentinian Army Staff College:

> It is difficult to understand why Third World countries, and others with limited financial resources, order or build small, slow warships. For a country to establish itself as a naval power, it would be more logical to procure submarines.[2]

The international arms market has responded admirably to the call for more diesel-electric submarines. A well-equipped, modern boat can be purchased from such countries as Russia, Germany, Sweden or France. Other countries, including Argentina, Brazil, India, South Korea and Turkey, build or assemble diesel-electric submarines under license to Germany. The Russians, quick studies in the business of capitalism, have been particularly active, delivering 118 submarines to 15 countries since the end of the Cold War. Included in this group are countries such as China, Iran, Syria, Algeria and India,[3] with which the United States' relationship can be described as tenuous at best.

Employment

The sea lines of communication which the United States relies upon for economic and military security thread through a series of straits. The most familiar of these are the Strait Of

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[*] According to Admiral Woodward, RN, the British battle group commander, they "…planned to minimize the danger of submarine attack by steering well clear of the Port Stanley area and its environs…" where the Argentine Type-209s were suspected to be operating. See Admiral Sandy Woodward with Patrick Robinson, One Hundred Days. The Memoirs of the Falklands Battle Group Commander. Naval Institute Press, Annapolis, MD, 1992, p.225.

Gibraltar, the Suez Canal, the Malacca Straits and the "door to Desert Storm", the Strait of Hormuz. Because of the narrowness of these maritime choke points, there is always the possibility that a hostile nation will attempt to interdict the flow of traffic through them. Iran has historically attempted to assert some level of control over the Strait of Hormuz. With the addition of three Russian *Kilo* class diesel-electric submarines to the Iranian Navy, the threat of future efforts by Iran to interfere with shipping in this channel, up to complete denial of access to the Persian Gulf, is a very real concern.[4]

Additionally, there are several global "hot spots" of interest to U.S. forward-deployed forces where the role of the diesel-electric submarine is growing. The Chinese purchase of two *Kilo* submarines from Russia (and projected future buy of six more) has raised the level of tensions in the Taiwan Straits and disputed Spratly Islands area.[5] Near India, the Maldives and Nicobar Islands areas serve as potential catalysts for future hostilities. The Indian Navy has built a formidable force of 18 diesel-electric boats.[6]

With the capabilities to covertly deploy minefields or to attack ships with torpedoes or guided missiles, the diesel-electric submarine is a credible threat to any shipping within its area of operations. A diesel-electric operating on batteries is extremely quiet, and therefore difficult to detect and

counter, especially in the vicinity of high ambient noise caused by surface ships.[7]

Crew proficiency has been the biggest factor preventing the successful employment of these highly capable platforms in the past. Returning to the Falklands-Malvinas conflict, post-war analysis attributes the tactical failures of the *San Luis* to the inexperience of the crew in the use of newly acquired torpedoes.[8] Internationally, this lesson that training and experience are critical elements in the employment of diesel-electric submarines has not been missed. It could be a mistake in the future to assume that a small navy which operates diesel-electric submarines does not have the crew proficiency to properly employ them. Singapore, for example, in their purchase of Swedish submarines, also contracted for crew training. India, China and Iran have had years to learn how to operate their *Kilo* submarines, enhanced by limited Russian help.[9] Each of these navies employs their submarines in major fleet training exercises with increasing regularity and proficiency[†].

There are some who argue that reaction to the perceived diesel-electric submarine threat is foolish, and that operating limits (slow speed, short range) and low crew skills make these

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[†] Iranian *Kilos* have annually participated in their Victory exercise, see LCDR William R. Bray, USN, "Five Fleets, Around the World With the Nimitz," U.S. Naval Institute Proceedings, Vol. 124, No. 10, Oct. '98, p.92, and Roger Gard, "Iran Turns up the Heat With Military Exercises in the Gulf," Scotland On Sunday, The Scotsman Publications Ltd., 22 Nov. '98, p.17. Chinese *Kilos* participate in Taiwan Straits exercises, see David Foxwell, "Sub Proliferation Sends Navies Diving For Cover; The Multiple Menace of Diesel Electric Submarines," Jane's International Defense Review, Vol.30, No.8, Aug '97, p.37.

submarines a benign threat to powerful blue water navies.[10] To support this argument is to deny the interactive nature of warfare and underestimate enemy capabilities. The technological capabilities of these submarines and their weapons are improving each year[‡], as are the skills of their crews. With the increased numbers of diesel-electric submarines and improved crew proficiency comes an expanded threat to U.S. military and commercial maritime traffic, with a related operational impact on the regional CINCs.

Operational Impact

> Time is one of the most precious commodities in the conduct of warfare and is closely related to the factor of space, for time is needed to overcome factor space.[11]

This description by Professor Milan Vego of the impact of factor time on operational warfare summarizes a dilemma faced by the CINCs, one which is exacerbated by diesel-electric submarine proliferation. In the current approach to expeditionary warfare, with U.S. forces routinely operating in remote areas along extended lines of communication, time becomes a valuable and irrecoverable commodity. Delays in the deployment and sustainment of these forces can be detrimental to the success of military operations.

[‡] Russia, for example, offers technical upgrades to already purchased submarines to ensure that they remain state of the art. The Rubin Corporation, which builds the *Kilo* submarines, has a strategy of "…selling new submarines to those who can afford them and modifying the boats of those who cannot," according to David Markov, "More Details Surface of Rubin's 'Kilo' Plans," Janes Intelligence Review, Vol.9, No.5, May '97, p.215.

Operation Desert Storm exemplifies the dependence of the United States on unrestricted sea lines of communication. At the height of the war this critical logistics tail represented a tempting target, a line of sea-lift ships 8000 miles long, stretching from America to the Persian Gulf, with a vessel every fifty miles along the route.[12] With the sustainment of U.S. forces dependent on sea lift for over ninety percent of the logistics, it is fortunate that Iraq lacked the capability to interdict this line of communication.

A CINC preparing to fight a future conflict on the scale of Desert Storm can not plan on the same unrestricted sea lines of communication. The Strait of Hormuz is a highly probable point of interdiction, and, a decade later, Iran's growing proficiency in the use of its *Kilos* increases the odds of encountering hostile delaying or sea denial efforts there. One supply ship sunk by a diesel-electric submarine could greatly impede deployment and sustainment efforts, causing intolerable delays to hamper U.S. forward operations. A choke point could become a bottle neck as merchant crews balk on entering the hazardous operating areas of diesel-electric submarines. In a large scale operation, requiring massive sea-borne logistics, U.S. forces might be pushed to their culminating point if such sea denial efforts are employed effectively. Contributing to an early culmination, factor force could also be negatively impacted by the sinking of a ship carrying U.S. troops to support military

operations, an operational attack with potential strategic implications.

Strategic Impact

The diesel-electric submarine has the ability to indirectly attack one of the United States' strategic centers of gravity, an opportunity missed by Argentina in her war against Britain. Wars waged by democracies are dependent upon the will of the people in the homeland to continue the struggle, a will that in recent years has become tied to an apparent aversion to high casualty rates. Had the *San Luis* been able to sink a British troop transport, causing a high loss of life, it is questionable whether Margaret Thatcher could have convinced the British public to continue to back the conflict[§]. Similarly, a diesel-electric submarine inflicting a high level of U.S. casualties by sinking a loaded amphibious troop carrier might be a grave test of the resolve of the American people. A course of action must be chosen to address the operational and strategic threats of the diesel-electric submarine.

Courses of Action

The courses of action available to address the growing problem of diesel-electric submarines can be divided into three

[§] As it was, the sinking of the HMS Sheffield by Argentine aircraft caused Mrs. Thatcher great political problems with maintaining the military effort

general categories: ignore, engage and avoid. Risk diminishes as we proceed through the options, but it does so at an escalating cost in terms of operational resources required and an increasingly negative impact on factor time. A maritime component commander deciding on the best choice will have to closely coordinate with the regional CINC to determine the right balance of risk, resources and timeliness.

Option 1: Ignore

Under normal peacetime conditions, the U.S. maritime policy is to not be deterred by sea denial threats in international waters or straits. The possible threat of the diesel-electric submarine is ignored under the cover of international laws protecting freedom of the open seas. Since no added delays occur when ignoring the diesel-electrics, there is no time impact on the deployment of military forces and logistics support.

As the potential for hostilities rises, such as when a crisis emerges in a possible diesel-electric submarine operating area, the "ignore" option takes on increasing risk. The maritime component commander must determine when additional resources should be committed to ensure the safe passage of military and commercial maritime traffic. This decision should consider the operational delay this enhanced maritime security might cause, an item of critical interest to the regional CINC.

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against the Argentinians, see Max Hastings and Simon Jenkins, The Battle for

Unfortunately the enemy can formulate a course of action which would take advantage of the lag between an "ignore" posture and a higher level of "engagement". A diesel-electric submarine which could transit to a firing position unimpeded and fire the first shots of a conflict against a U.S or friendly high value unit, such as an amphibious assault ship loaded with U.S. Marines, could strike a severe operational, and potentially strategic, blow. It is therefore imperative that the shift between the "ignore" option and one of "engagement" in terms of the diesel-electric submarine problem be addressed early in a crisis.

Option 2: Engage

> By defeating enemy area denial threats and keeping vital sea and air lanes open, we ensure an uninterrupted flow of reinforcements into the theater.[13]

With this statement, the CNO describes the offensive nature of the U.S. Navy when encountering increasingly hostile sea denial acts. What is not described is how threats like the diesel-electric submarine will be kept from sea lane interdiction. In the post-Cold War U.S. Navy, the answer to this question, a robust antisubmarine warfare (ASW) capability, has often been neglected. The CNO has recently recognized the necessity to refocus U.S. efforts to ensure "…the United States remains the most formidable ASW force in the world."[14]

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the Falklands, W.W. Norton and Company, New York, 1983, p.167.

With this increased recognition of the subsurface threat the Navy may reemphasize ASW training, but it is doubtful that the austere budget will provide additional U.S. Navy resources to improve capabilities against the diesel-electric submarines. It is therefore important for the CINCs' maritime planners to consider all of the ASW tools available, including both joint and combined forces. The diesel-electric problem in a hostile environment is essentially defensive: it is not as critical to destroy the enemy submarines as it is to ensure they do not get the opportunity to attack friendly forces or interdict sea lines of communication. This defensive security supports the CINCs' desire for an uninterrupted, timely flow of operational forces and logistics.

The stealthy nature of diesel-electric submarines is their greatest strength, but it can also serve as an Achilles' heel. They must stay hidden to survive, because their slow speed makes them vulnerable to counter-attack. But in the words of Rear Admiral W.J. Holland, "Submarines hiding are not submarines attacking."[15] Aircraft are particularly effective in this regard: radar saturation of critical maritime operating areas, such as straits, keeps diesel-electric submarines away from the surface to recharge batteries or to target friendly ships.[16]

It is in this area that joint and combined force efforts can provide leverage. Any aircraft with a surface search radar can help deter a submarine from coming to periscope depth. Air Force

surveillance aircraft can contribute during a "hold-down" period to secure a strait from the threat of a diesel-electric. Better still, many U.S. allies have very effective maritime patrol aircraft to subsidize those of the U.S. Navy. In Asia and the Western Pacific these include South Korea, Australia and Japan, all of whom fly a variant of the U.S. Navy's P-3. On the European side, there are many NATO members with excellent airborne ASW forces, including Britain, Germany and Norway.

To further increase the effectiveness of this "hold-down" approach, surface ships and aircraft using active sonar add to the stress of a diesel-electric submarine trying to avoid detection, reducing the risk of successful attacks. Upon detection, or in high areas of probability, the use of ASW weapons, even inaccurately deployed, further increases the anxiety of submarine crews to help deter accurate attacks.[17] Again, friendly foreign navies can support U.S. forces in providing these capabilities. Another alternative in these resource constrained times is to re-equip the U.S. Coast Guard's large cutter fleet with active sonar** to assume ASW convoy escort duties, an extension of the current "National Fleet" concept of interoperability with the Navy[18].

** As part of their long term preparedness, the U.S. Coast Guard has the ability to reconstitute 25 frigate/corvette type cutters as ASW escort ships, including sonar and ASW helicopter capability, Operations Department, U.S. Naval War College,"The U.S. Coast Guard: A Unique National Security Instrument," NWC 3123, June '93, U.S. Naval War College, Newport, RI, pp. 29,37.

This attack deterrence, or "hold down", approach is the least resource demanding "engagement" option, but does not completely eliminate the risk of diesel-electric submarine attacks. Minimizing this risk requires an even more aggressive combined ASW effort using friendly attack submarines, aircraft and ships to actively hunt the adversary submarines. As stealthy as modern diesel-electric submarines are, finding and destroying them once submerged demands an exorbitant amount of time and resources with limited past success. For example, despite the time, effort and ordnance expended by the British, the captain of the Argentine submarine *San Luis* later said his boat never came under direct attack.[19] The maritime component commander should measure the impact of this aggressive ASW posture against other possible uses of assigned forces. At a great increase in cost in terms of required ASW resources, and an increased time delay to transiting forces, it is questionable how much more maritime security benefit this approach provides than the less resource demanding and time impacting "hold down" option.

Option 3: Avoid

A final course of action available is to avoid areas where diesel-electric submarines might be operating during periods of hostilities. Avoidance was one of the ways in which the British dealt with the Argentine submarine *San Luis,* keeping their surface ships out of this submarine's expected operating range.

While this option provides the lowest level of risk, it is potentially the most costly in terms of additional required resources, and causes the greatest time delay in the deployment and sustainment of forces. It would be possible to establish offshore bases which would not require our slower, more vulnerable logistics ships to cross through sea denial areas enforced by diesel-electric submarines. The Mobile Offshore Base concept has gained some support in the Navy and in the Pentagon, but is dependent upon significant additional funding[20] within an already tightly stretched military budget.

In addition to building and maintaining the bases themselves, the problem still remains of moving troops and supplies from offshore into the operational theater. Some ways to do this and avoid the diesel-electric submarine threat are to use airborne transports, such as cargo helicopters, or fast surface lift, like the air-cushion landing crafts (LCACs)[21]. The relatively small cargo carrying capacity of the helicopters and LCACs make this solution expensive, time consuming and impractical for major forward-deployed operations.

Emerging technologies promise such hybrid water-air logistics transport vessels as the wingship, a craft the size of a small merchant ship which uses aerodynamic surface effects to operate just above the water while transporting large loads of cargo.[22] Such a vessel could transit a sea denial area with little fear of diesel-electric submarines or even a covertly

seeded minefield. Although international commercial development of these ships is ongoing, the reluctance of Congress to commit money to this effort means that this solution in not something the CINCs can plan on for the foreseeable future.[23]

The idea of avoiding operations in international waters and straits is contrary to United States' stated aims of enforcing global access and freedom of navigation[24]. With its severe negative impact on the timeliness of operations, this choice concedes victory to the delaying and sea denial efforts of the diesel-electric submarines. It is therefore unlikely that, even threatened by possible hostile actions by diesel-electric submarines, the maritime forces of the United States will avoid them.

Conclusions

The diesel-electric submarine's proliferation on the global arms market presents a challenge to maritime component commanders supporting forward-deployed operations. There is a growing risk to regional CINCs that nations hostile to the United States will use their diesel-electric submarines for delaying and sea denial purposes. In a future conflict on the scale of Desert Storm, the United States' critical sea lines of communication might be interdicted by hostile diesel-electric submarines, leading to intolerable delays in the deployment and sustainment of U.S. and

friendly forces. Additionally, diesel-electric submarines can be used to attack operational and even strategic centers of gravity.

Recommendations

Of the three options presented as possible courses of action to meet the diesel-electric submarine threat, the "engagement" option strikes the best balance between risk, resource cost and timeliness. The "ignore" option, though attractive due to its non-impact on factor time, becomes extremely risky under the threat of hostile intent on the part of the diesel-electric submarines. As regional tensions increase, it is critical to quickly address the submarine threat by engaging them at the decisive maritime choke points.

The most effective "engagement" approach, providing a reasonable level of risk, relatively low resource expenditures and an acceptable impact on timeliness of maritime transits, is the "hold-down" option. By keeping the diesel-electrics hiding by saturating the choke points with radar, actively pinging sonar, and attacking areas of probability when authorized, the threat of attacks can be minimized. Leverage can be achieved by using the ASW capabilities of other services like the Air Force and possibly the Coast Guard, as well as those of our allies. Going beyond this level of engagement into hunting the diesel-electric submarines will not yield the results necessary to

justify the dramatically increased resource requirement and time impact.

While the "avoid" option dramatically lowers the risks, it is costly and does not support the philosophy of the United States of unrestricted access to international waters. It also raises the time requirements for deploying and sustaining major operational forces to levels unlikely to be acceptable to a CINC during critical operations.

Against the tyranny of distance in expeditionary warfare, time is an indispensable quantity to the CINCs, one vulnerable to theft by diesel-electric submarines. By imposing delay or denial actions on the military forces and their sustainment, the diesel-electric submarine can be detrimental to successful forward operations. In the words of the Chinese philosopher of war, Sun Tsu, "If ignorant of both your enemy and yourself, you are certain in every battle to be in peril."[25] It is important when considering the problem of the diesel-electric submarine that the maritime component commander choose a course of action which does not underestimate the capability of the enemy. It is equally important to balance risk and resources against factor time to effectively counter this growing strategic and operational threat.

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