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Muddy Waters and the Iron Depth Charge

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The problem of how to defend the myriad of shipping assets that must transit in and out of shallow water in time of war has plagued naval planners since World War I. Whether it be the delivery of materiel to ports or the opposed amphibious assault in a hostile environment, the successful completion of nearly every naval evolution terminates in shallow or restricted waters of some type. It is in these waters that the advantages of conventional submarines outweigh the advantages of nuclear-powered ones and any disadvantages of the former are reduced. Little attention has been paid to this area of antisubmarine warfare (ASW) by the US Navy in the past two decades. While Nato and, perhaps more significantly, the Communist bloc naval forces have advanced their levels of shallow water ASW knowledge, techniques and weaponry; the US Navy has turned away from this arena and concentrated its efforts on deep-water capabilities. But one fact looms certain, Admiral of the Fleet Gorshkov—in his twin positions of Chief of Naval Operations and Secretary of the Navy—has driven the levels of the Soviet "coastal" submarine force beyond the numbers needed to protect the shorelines of Mother Russia.

In building the relatively cheap diesel boat, the Soviet Navy acquired a formidable "manned-minefield." At the same time, this buildup has not unduly alarmed Free World defense analysts who generally cringe at any Soviet advancement in nuclear related technology or strength. By using the shallow water found near all ports, a diesel boat has an excellent chance of approaching the shipping lanes undetected and remaining in position on the bottom as long as it is tactically expedient. The sound levels and the general distortion of any propagated wave in these waters make long-range detection impossible and passive search equipment normally used in deep water is useless. The probability of detection of a diesel-powered submarine is obviously greatest when it snorkels to recharge battery, but even this is greatly reduced if the engines used in the sub closely approximate the size, number of cylinders, and RPM used in commercial vessels. Since all submarines depend on their ability to remain undetected until they attack, then escape in the confusion caused by the attack, nothing tactically has been lost by the use of this type submarine in

the antishipping role. They also free the nuclear-powered forces for deep-water operations or operations where the transit distances involved make it impractical to use diesel boats.

How then to counter this threat: what assets are currently in the US inventory that are suitable for use in the environmental constrictions that shallow waters present? Historically small patrol craft have been used to guard against intrusion by unfriendly submarines in coastal waters. We currently have a few of this type craft, but they are configured for surface warfare/interdiction modes of operation and, in any case, there are far too few of them to patrol the sea lanes that would be of concern.

Passive acoustic sensors are of little use in shallow water. The degradation caused by reverberation, bottom bounce distortion, biologics, and surface interference all but nullify any advantages passive acoustic prosecution may have in deeper water. Fixed arrays are both costly and too slow for tactical application. The existing hull-mounted sonars in the fleet were specifically designed for optimized convergence zone prosecution. They require extremely high power outputs and deep water to allow the sound beam to bend sufficiently to reach the convergence zones. Both the frequency and the power output of the SQS 26/53 sonars contribute greatly to reverberation and distortion in shallow water conditions.

The Soviet Navy has about 150 diesel submarines on active duty plus another 80 in reserve; there is clearly a need for a weapon that can be used effectively against these boats in shallow water.

The AN/AQS 13 series variable depth sonar presently carried on board the SH3H Sea King helicopter does not suffer as greatly from the above mentioned problems owing to a relatively small power output and a higher frequency spectrum than is used in hull mounted sonars. With the introduction of the Sonar Data Computer (SDC), a microprocessor capable of greatly reducing the reverberation observed in these water conditions, the AN/AQS 13E sonar has significant advantages in the prosecution of shallow water targets. The relatively short range of this sonar under these conditions is not a significant liability, since it is mounted on a platform capable of much higher speed than its target. The sonar has the added advantage over nonacoustic sensors of having a continuously valid fire control solution when it is in contact, requiring no other sensor confirmation. The helicopter is also capable of attacking in a hover with the sonar in the water.

The Soviet Navy has about 150 diesel submarines on active duty (plus another 80 in reserve) and since it shows no signs of abating its efforts to produce more, there is clearly a need for a weapon that can be used effectively against these boats in shallow water. Tactical nuclear weapons are not feasible for a variety of reasons, both political and technical. At the

present time the only nonnuclear weapon for ASW in the surface and air communities is the Mk-46 torpedo. This weapon was introduced to the fleet in the mid-1970s and was designed to acquire and attack a slow to medium speed target in the open ocean. Its attack profile guards against attacking very slow moving or stationary targets. Therefore, if the submarine commander does not panic when he hears the active dipping sonar make contact and the torpedo starts its run, he stands a very good chance that the torpedo will not attack him, regardless of the validity of the helo's fire control solution.

The depth charge suffers from none of the shortcomings of the Mk-46 torpedo. It can be carried in large quantities in the magazines of large combatants, in a defuzed condition, and much the same as iron bombs are presently stored. The preparation time would be about the same as the bombs: screw in the fuzes and load them on the aircraft. Because they are relatively cheap and small in size (compared to the Mk-46), many more could be deployed aboard a carrier than space allows for torpedos in the present loadouts.

The main utility of the depth charge as envisioned here would be in the area of shallow water attacks on slow submarine targets. It would not be restricted to this use alone, however. The usefulness of such a weapon can easily be seen for convoy protection or close-in battle group defense against torpedo attack. In the high noise environment, the fact that the depth charge gives no warning of its presence when dropped is a significant tactical advantage in the "first hit wins the fight" type of scenario envisioned in the war plans of today's planners. Since subsequent attacks (if launched from an aircraft) would give no warning either, the psychological factors of even possessing such a weapon would be of enormous value in keeping Soviet attack submarine commanders "honest." In defending a convoy of slow moving merchant ships, this weapon would alleviate the inevitable shortfall of ASW weapons that convoying would inevitably put on the supply system. The small size and relatively light weight of an air-dropped depth charge would fit nicely into the space allotted for weapons in the projected Arapaho packups that have already been designed and tested. They would require little maintenance or buildup.

Perhaps the most useful employment of this weapon would be in the support of amphibious operations. The type of bottom and geographic constraints necessary to successfully implement an amphibious assault make the ships carrying the Marines particularly vulnerable to torpedo attack by a diesel boat while engaged in the relative stationary mode of offloading troops and equipment. Under present doctrine these forces have little ASW protection while in close proximity of the shore. To counter this threat, two or three dipping sonar helos could be embarked aboard any of the aviation capable ships that could take them (LHAs, LPHs, LPDs, and LSDs). The helos

could screen the approach to the beach then move to the sides and rear of the force and continue screening until the landing was complete or relieved on station. The weapons carried aboard these helos could also be used to concussively clear approaches to the beaches that were suspected of having been mined.

The attack vehicle need not be a helo. For example, a single carrier-based S3A Viking could carry ten 250 pound depth charges. An AV-8B Harrier, commonly deployed aboard LHAs and LPHs in support of amphibious operations, could carry a maximum of twelve 500 pound depth charges (given that the shape of the weapon allowing them to be fitted onto presently used ejection racks). Lamps MK I and MK III could carry two of either size. The SH3H Sea King could carry four of either size. CH46s or CH53s could be fitted with roll-racks for clearing areas of advance to the beach. A P3 Orion could carry twelve depth charges, but due to the paucity of assets for long-range patrol aircraft and the amount of area to be searched, it is not envisioned that P3s would be utilized in this manner. In all cases the dipping sonar helo would be the primary sensor suite used to track and attack the slow, shallow water submarine. The delivery vehicle could be chosen by the group commander, based on the tactical situation and the assets on hand. Probably the best combination of platforms would be hunter/killer groups made up of one or more SH3Hs (or SH60F) and one or more S3As, working as a team off the carrier. These ASW forces routinely operate together and have several exercise qualifications that can be met only by using each other's platforms.

Practical consideration would probably require the helo to break dip before the charge was dropped to preclude damage to the sonar. The Aspect mode of the AN/AQS 13B/E sonar graphically displays the actual outline of the submarine's hull. This feature would be very useful in determining the battle damage assessments and the necessity for reattack.

With the emphasis on utilizing the presently held assets in the US inventory and the paucity of funding for new weapons development, the case for reintroduction of depth charges is undoubtedly a difficult one to sell. The fact that the allied navies have retained an airborne depth charge capability (even if only in reserve) and have pressed for development of more and better dipping sonar helos, is a strong argument in favor of this weapon and sensor mix to thwart the shallow water, diesel submarine threat posed by the Warsaw Pact navies. In light of the Soviet emphasis on conventional submarine technology and numbers, this shortcoming in our ASW forces looms as a major deficit if the US power projection forces are to remain viable in their intended global role.

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