THE SUBMARINE REVIEW

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EDITOR'S COMMENTS

The best indications for the intellectual direction of the defense policy debate have to do with conventional deterrence. In the lead article, reprinted here from the editorial section of The Washington Post, one of this (or any) nation's most knowledgeable authorities on what works in national security affairs, Ambassador Paul Nitze, raises the issue and suggests that the United States has a responsibility to pursue an alternative to massive nuclear deterrence. It can be expected that over the next year or so the subject will be discussed with increasing vigor. It can also be expected that those discussions will center as much on budgetary matters as on military effectiveness. We have already seen that some in Congress have concern for any new start along those lines, and it has been reported (Inside the Navy, March 7, 1994) that the President has assured them "that the Navy is not pursuing the development of a conventional warhead for its Trident missiles".

With that introduction and caveat, **THE SUBMARINE REVIEW** opens the larger policy discussion to a readership which is arguably the country's most experienced in the practice of effective deterrence. Several articles have already appeared in these pages concerning the pros and cons of conventional warheads for SLBMs, and there will be more of those as the subject receives more attention. The question of *what-should-be-done*, however, is a much different one that *what-can-be-done*. As Ambassador Nitze intimates, the issue of adopting a form of conventional deterrence versus total reliance on massive offensive nuclear capability really goes to the heart of the question about what Americans believe to be their place in the future world.

Rear Admiral Rick Buchanan has contributed a very thoughtful article to accompany Ambassador Nitze's. He discusses some implementation concerns which have to do with the application of deterrence in our new multi-faceted world of regional, vice global, security problems and then considers that application for the general conventional weapon case. It has to be noted that Rear Admiral Buchanan has framed his comments in the view of one who has worked within the CNO's Joint Mission Area effort on Strategic Deterrence.

Historically, the subjects of the other articles are spread fairly evenly across a period of about 60 years. There are two World

War II-based pieces; one on the enemy's suicide torpedoes, and the other on the record of the Dutch submariners who got away from the Germans to fight for the Allies. The Cold War building program is represented by the second of a two-part series about TRITON, the dual reactor radar-picket that went around the world in 1960. The current period is reflected in our first piece about the Swedish Navy's submarines. Two near-future projections round out our time spectrum with *what-ifs* about capabilities that seem to be close to developmental possibility.

The series on a Submarine Bibliography features articles that appeared in the Naval Institute Proceedings after NAUTILUS got underway on nuclear power in January of 1955. By 1966, it was more than obvious that a significant change had taken place in the conduct of naval warfare, but its exact dimensions were not yet clear to most of the Navy. Reprinted in its entirety is the Naval Institute's prize essay of 1966, *The Submarine's Long Shadow*, which went a long way toward articulation of the impact of the nuclear submarine. The author of that essay has updated for us his 1966 impressions, and has added some background that will be of particular interest to all who were involved in the surface and air ASW efforts of the late '60s aimed at controlling the nuclear submarine threat.

The war patrol from 50 years ago is excerpted from HARDER's justly famous Fifth War Patrol, under Commander Sam Dealy. That was the patrol in which he sank five (at least) destroyers, conducted a surveillance of the Japanese fleet in its anchorage, and maybe even precipitated the Battle of the Philippine Sea. The part reported here, however, concerns a special mission in which HARDER picked up a party of agents in North Bornea. Flexible submarine multi-mission excellence is not a new concept.

Last, but not least, we have to note that among the several excellent book reviews in this issue is one by Vice Admiral Jon Boyes on a new book by the **REVIEW**'s first editor, Bill Ruhe. Congratulations Bill, the book sounds great and we all look forward to reading it when it hits the stores, just about the same time that this issue is in the hands of the membership.

Jim Hay

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FROM THE PRESIDENT

For those who dwell in peace and tranquility beyond the Beltway, be aware that, in the cross-fire of the current budget battle, we find submarines in a somewhat contradictory situation: the post Cold War force level of fifty SSNs, plus or minus five, established in several credible independent studies, does not appear to be in dispute; the unique warfighting capabilities that submarines bring to joint warfare have awakened new and diverse proponents; the need to preserve the very special and very fragile submarine technology and industrial bases is recognized at the highest levels of government; but, at this writing, the will to make the national commitment is at *top dead center*.

As the surviving superpower with global responsibilities, and as an island nation dependent on free access to the seas for commercial as well as military needs, we must have a strong Navy, and submarines are among the most versatile and cost-effective elements of that Navy. Perhaps not obvious in the many assessments, analyses, computer modeling, and war games, one inherent truth remains: Although the nature of the threat may vary, and the scenario may shift from one environment to another, there will always be a need for covert, independent, sustained operations, and only submarines would be capable of executing the mission.

Although it may not be palatable, a state of the art nuclear attack submarine with the stealth and offensive capabilities necessary to maintain a tactical advantage over a technologically feasible threat for the next thirty years will not be *cheap*. As the mechanic in the oil filter ad says, "Pay me now, or pay me later". Later may be too late in a world on the razor's edge of stability.

In a more mundane vein, we are expanding our membership data base to include submarine or submarine-related assignments so that we can call up a list of those who served in a specific ship, or worked on a certain project to facilitate reunions, research efforts, and the like. We are also in a *full court press* to expand active duty membership, from the top down, and hope to increase our corporate sponsorship by approaching the second tier suppliers and contractors.

To the 600 plus very patient contributors to our Submarine History Book, we expect to have the presses rolling soon. We think you will be pleased with the product. In addition to the

biographies, there is a great introduction to the Submarine Force by RADM Mike Rindskopf, and a very special early history of submarines by Dr. Richard K. Morris. The book should be in your hands before the June Symposium.

Planning for both the classified Submarine Technology Symposium at The Johns Hopkins University Applied Physics Laboratory in May, and our Annual Submarine League Symposium in June is complete. Registration packages for the latter are in the mail. Please plan to join us for another great get-together.

Bud Kauderer

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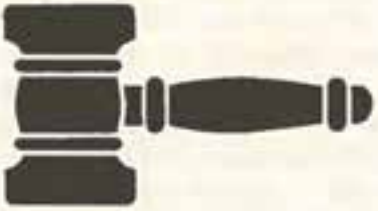

MEMBERSHIP STATUS

	Current	Last Review	Year Ago
Active Duty	895	925	982
Others	2694	2728	2737
Life	255	254	243
Student	26	25	28
Foreign	67	69	76
Honorary	18	19	21
Total	3955	4020	4086

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IS IT TIME TO JUNK THE NUKES?

by Paul H. Nitze

[Ed. Note: The following appeared in the Outlook section of the January 16, 1994 issue of The Washington Post, and is reprinted here with permission.]

Just as last week's NATO summit was a reminder that the world faces a future in which the United States has become the sole global power, it likewise signals that it is time to re-examine the role and place of strategic nuclear weapons in American security policy. With the dissolution of the Soviet Union and the division of its nuclear forces, the concerns of U.S. strategic planning have shifted from a single nuclear threat to a complex international situation—from Iraq to Ukraine to North Korea—where regional aggression is more likely than it has been since before World War II.

Our experience, including the Gulf War, also teaches us that nuclear weapons are unlikely to be useful in deterring aggression in these circumstances. Rather than rely on them, therefore, the United States should consider what might seem at first glance a step backward: converting its principal strategic deterrent from nuclear weapons to a more credible deterrence based at least in part upon *smart* conventional weapons. It is a shift that could be justified as a coldly rational approach to a new security strategy and equally so as a morally correct foreign policy choice.

The case for choosing strategic, high-precision conventional weapons over strategic nuclear weapons is clear. They are safer, cause less collateral damage and pose less threat of escalation than do nuclear weapons. Thus they offer far greater flexibility in a variety of situations where use of any sort of nuclear weapon would be politically or militarily impractical.

The principal challenges to reliance on strategic conventional weapons are also clear. Can they adequately carry out their combat missions? If so, will that fact deter aggression as effectively as nuclear weapons appear to have done? I believe the answers to these questions are, in general, positive and that a strategic conventional military option may become practical for many strategic missions previously thought of as a nuclear preserve.

The Gulf War offered a spectacular demonstration of the potential effectiveness of smart weapons used in a strategic role. Against Iraq, such weapons rapidly rendered useless the military forces of a powerful dictator, in particular by neutralizing his command, control and communications facilities.

At the same time, the Gulf War showed the limited value of nuclear weapons in deterring aggression. Indeed, I would argue that there was no useful role for nuclear weapons for *anyone* in the Gulf War; Iraq could and did simply ignore allied nuclear weapons as virtually chimerical, even when it attacked Israel. Likewise, Iraq would have gained little by employing a nuclear device. It would not have been possible for Saddam Hussein to diminish significantly the overwhelming military superiority of the forces arrayed against him. For him to have used such a nuclear capability as he might have developed would merely have reinforced the determination of the major powers to eliminate him.

It is also true that a nuclear capability in Saddam's hands might have undermined U.S. efforts to force him to behave responsibly. Nuclear weapons used in desperation, or in a wild plan of revenge against Israel, could have resulted in great human tragedy. We cannot know whether or not Saddam would have used nuclear weapons had he possessed them. But we also cannot know whether the allied nuclear threat could ever be counted upon to deter him from using them.

After all, Saddam chose to start a nuclear weapons program in the very face of the overwhelming nuclear power of the states arrayed against him, including the Israelis he sought to provoke. There was no logical reason for Iraq to build a nuclear weapon outside of this threat of irresponsible behavior; the looming threat of a wildcard, regional nuclear power. To my mind, Saddam's decision to embark upon a nuclear program itself demonstrates that there was no nuclear deterrent at play in Iraq's evaluation of the strategic situation in the gulf.

In the aftermath of the Gulf War, as the lessons of the successes, failures and potential of conventional, smart weapons are digested by all nations, one message rings loudest: The United States, when provoked, can and will use strategic conventional weapons against whatever targets it considers appropriate.

Understanding this single lesson may offer us a way to create the first credible and therefore useful strategic deterrent we have seen since the early days of the nuclear era. It may well be that

conventional strategic weapons will one day perform their primary mission of deterrence immeasurably better than nuclear weapons if only because we can—and will—use them.

It is now vitally important that we understand both the effectiveness and limitations of strategic conventional weapons. Unfortunately, much of the postwar popular evaluation of our weapons is based on perceptions drawn from media coverage—coverage often well managed by the Department of Defense. The professional discussion has been superficial, often little more than speculation about the levels of nuclear weapons required in a post-Cold War strategic environment.

However, the absence of informed discussion of the capabilities of this and the next generation of strategic conventional weapons should not keep us from opening a general debate over the future of nuclear weapons. The most encouraging development for Americans is that we may begin to plan a national security strategy that does not rely as heavily on nuclear weapons. For the first time we might reasonably contemplate making nuclear weapons largely obsolete for the most practical and fundamental strategic missions.

From a policy perspective, there should be a conscious decision by the government to pursue the conversion of our strategic deterrent from nuclear to conventional weapons. It is no stretch to assert that we can and should now begin to decide not whether, but in what manner, this conversion will take place. Our discussion ought to focus on what strategic nuclear and strategic conventional weapons can and cannot do and what we should do to maintain and improve the capabilities of these weapons.

But to begin such a discussion, we must establish the truth about smart weapons, especially strategic conventional ones. Even though advanced conventional weapons appear to have performed well in combat, we must be careful as we evaluate how good a model the Gulf War provided for understanding the future utility of such weapons as a deterrent.

To much of the world viewing the Gulf War on television, smart weapons appeared a miracle weapon, a new panacea for all sorts of conflicts capable of doing the job with little loss of military personnel and limited civilian losses. This perception caught the imagination of a people with the reasonable desire to limit human suffering and loss of life under any circumstances.

Unfortunately, this may be an unreasonable perception at the current stage of strategic conventional weapons development.

The lessons of the military utility of nuclear weapons must also be re-examined and frankly acknowledged. We will never be certain what has deterred the use of nuclear weapons since 1945. We can speculate that the strategic nuclear arsenals in their morbid way did stay the use of these weapons, that mutually assured destruction may have prevented the use of nuclear weapons against other nuclear powers. But in truth, using nuclear weapons has never entirely been ruled out, and much of the debate of operational nuclear strategy during the Cold War reflected this reality.

What inhibited the American use of nuclear weapons was clearly sensitivity to the implications of the destructiveness of such weapons. And however much U.S. military doctrine asserted otherwise, their use was never an easy option to the Untied States, and some troublesome governments have known this and exploited it as a weakness in U.S. military posture. While the McNamara-era decision to move towards flexible response certainly led to a more credible U.S. military presence and deterrence for some situations, it did not improve our strategic deterrent. We were left with a massive investment in a nuclear arsenal of limited use except in possibly deterring a nuclear attack by the Soviet Union directly against the United States. It was a one-use strategic deterrent. Developing true strategic conventional weapons offers us a flexible capability that no aggressor can discount safely in a wide range of circumstances.

Certainly, it would be wise to continue to maintain a secure and widely dispersed array of nuclear weapons and their delivery systems until we are assured that the nuclear weapons of others constitute no threat to the United States and its associates. But possession of such nuclear strategic superiority does not, by itself, answer whether it would be wise for the United States actually to use its nuclear forces even in retaliation to the initial use of nuclear weapons by another country. After all, if the country initiating such use could be effectively disarmed by conventional forces, there would be no military reason to retaliate with a nuclear strike.

But how close are we to possessing conventional weapons that can indeed replace nuclear weapons as the primary deterrent against aggression?

Today, there remains a gap between the destructive power of a first class strategic arsenal, such as that of Russia, and the ability of American strategic conventional weapons to overcome such a threat. Understanding and overcoming this gap should become the focus of technological research into the practical obstacles of delivery, accuracy and explosive capability, as well as planning security strategy and tactics.

The Gulf War suggests that U.S. conventional weapons could offer an adequate deterrent against regional aggression. We must still evaluate whether other powers, such as China and Russia, have come to this conclusion. But the present threat does not come primarily from these nations but from states such as Iraq, North Korea or even Libya. While we need to understand what motivates the weapons programs of these states and try to develop a new method of deterring them, it is, unfortunately, not clear that any strategic weapon can deter the ambitions of a tyrant.

The United States should recognize its responsibility to help shape the pattern and purpose of security arrangements worldwide to the long term interests not merely of the United States but of the world as a whole. The idea that the future peace and well being of the world should rest upon the threat of nuclear annihilation of large numbers of noncombatants is, in the long run, unacceptable. We should treat with scorn these, like North Korea, who may attempt to blackmail others with imprudent nuclear threats.

In the world as it is, we will continue to need nonstrategic conventional forces to stop aggression as it unfolds. We will also need to maintain an overwhelming nuclear strategic capability, though not necessarily to use such weapons—even in retaliation—if we can disarm an aggressor with smart non-nuclear strategic weapons. We must learn not merely to react, as eye for eye, or out of anger, but with wisdom and a sense of the great responsibility that comes with great power. ■

[Paul Nitze, former arms control negotiator and ambassador-at-large during the Reagan administration, is diplomat-in-residence at the Paul H. Nitze School of Advanced International Studies, Johns Hopkins University.]

NEW THINKING ABOUT DETERRENCE

by RADM Richard A. Buchanan, USN
Director
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"*Is It Time to Junk Our Nukes?*" teased the headline from the Paul Nitze article in the Outlook Section of the Sunday, January 16, 1994, Washington Post. "*The New World Disorder Makes Them Obsolete*" asserted the article's subhead.

Could someone as distinguished as Paul Nitze be arguing that the time has come for the United States to give up its nuclear weapons? Not quite, but he does argue that the time has come for us to "re-examine the role and place of strategic nuclear weapons in American security policy". And, in general, in addition to debating the merits of nuclear weapons in our strategy, the potential for strategic deterrence of regional aggression with conventional arms is the premise of the article. Ambassador Nitze believes that the changes going on in the world and in weapons technology will eventually allow us to deter regional aggression with conventional weapons alone. But, contrary to the editor's headline, a few paragraphs before the end of the article Mr. Nitze makes clear that we have to have nuclear weapons for the time being. But what about deterrence with conventional weapons?

Conventional strategic deterrence is an intriguing concept and one that has for more than a year occupied the thinking of those in the OPNAV staff responsible for the Strategic Deterrence Joint Mission Area. Deterrence using conventional means is possible if your weapons are good enough, if you can choose the right targets, if you have the will to make the appropriate action at the appropriate time, and if you can communicate clearly to the potential adversary, then you can deter him without resorting to the threat of nuclear weapons. Those are several big *ifs* but the idea is reasonable; the technology is available and the potential benefits make the idea well worth the focused thinking and energy required to figure out how to make it work.

If achievable, not only would conventional deterrence make the world a safer place, it would cost an order of magnitude less than fighting a war. If there is one hard truth about the future that is not arguable, it is that we cannot afford war. It cost $60B for the six months of Desert Storm and uncounted billions of dollars to

repair and rebuild the damage of the war, and this doesn't even include the billions in lost oil resources and revenue. The cost in human suffering is impossible to estimate. Thus, the attractiveness—the cost benefit, if you are an analyst—of conventional deterrence is obvious.

The trends in conventional weapons that make them attractive for use in a conventional deterrence strategy were evidenced in Desert Storm: accuracy, lethality, stand-off capability, minimum unanticipated collateral damage and low risk of U.S. casualties. Whatever the *standards* were prior to Desert Storm, they were certainly raised during that short war. The TV images of pinpoint accuracy and the highly touted results of the air campaign reinforced in the national psyche the concept that we can fight *surgically*. Regrettably, we now are the victims of our own spin doctors and have to live with the fact that Desert Storm established new warfighting *norms*. Undoubtedly, technology will make greater precision, range and lethality even more of a reality than it currently is.

As we are better able to deliver a weapon with precision, with minimum risk of U.S. casualties and with no unexpected collateral damage, conventional deterrence lies ever closer to the realm of the do-able.

Choosing the right target does not, in the context of conventional deterrence, always mean picking a target for military strike. It could mean that, but **deterrence involves much more than military action.** We must, as a nation, learn to use the political, economic **and** military tools at our disposal to deter an adversary from taking action inimical to our national interests. Too often we have failed to act in a timely manner or with all the means available to us to prevent escalation or the tragedy of conflict. The right target means understanding the adversary's value structure and the regime's leadership and decision-making process so that deterrence actions can be *targeted* to achieve the desired outcome at the least cost. That means properly focused, early, integrated action.

If the proper target is a digital system, so be it, and we use a *byte bomb* to shut it down—for a few days as a demonstration of our capability, or, permanently as a message to a tyrant. Perhaps the right target is a critical component of the adversary's military infrastructure and a precision weapon would be appropriate. In other cases, it may be more effective to *hold-at-risk* some non-

military asset of great value to the adversary. Maybe the proper target can be *attacked* economically. The possibilities are endless, but knowing enough to be able to select the *right target* involves early and good intelligence. This is a current shortfall.

Knowing the right target and having the right weapon to attack it is credible only if there is the national will to use the tools available. National will is not a public consensus for the action. National will has to do with not overstating what we are prepared to do. National will means taking the necessary action even if a public consensus is not apparent. The national will of the United States defies predictability, and this is not a disadvantage; however, the contrast between our resolute national will prior to and during Desert Storm and the indecipherable nature of our national will toward Bosnia, Haiti and nuclear proliferation in North Korea sends a very mixed message to the world. We must carefully nurture the perception of our national will if we wish to achieve our goal of deterrence, whatever the means.

And, lastly, what about communicating clearly with the adversary? What does that mean and how do we do it? First, we must be clear about what we want to deter. Then, if an adversary is contemplating actions that are inconsistent with our deterrence objectives, we must convince him that the costs of his actions will exceed any possible gain, that such actions will not succeed, and/or that any gains he might achieve through aggressive acts will be taken back. By creating in the adversary's mind the fear of failure, the likelihood of excessive cost, the conviction that he cannot benefit and/or the perception that the response to his action would be unacceptable, deterrence can be achieved. As was the case during the Cold War, and will continue to be true in the future, deterrence is successful only if the aggressor believes the capability to deter exists and the capability will be used. The continued applicability of this principle will be true in global nuclear deterrence or in deterrence of a regional aggressor.

What we are trying to deter can be generalized in several deterrence objectives; specifically, deterrence of the following:

- Acquisition, production or proliferation of weapons of mass destruction
- Use of weapons of mass destruction
- Military aggression/hostilities
- Terrorism

- Interference with international commerce/rights of free passage

The issue, of course, is whether conventional means alone are sufficient to achieve these deterrence objectives. The answer, for now, is probably not. And, as Ambassador Nitze says, "...it would be wise to maintain a secure and widely dispersed array of nuclear weapons and their delivery systems..." The Strategic Deterrence Join Mission Area seminar games have all verified that a nuclear weapons capability is still required as a bedrock of our deterrence capability, and who knows what deterred Saddam Hussein from using his weapons of mass destruction (nuclear and chemical)? Perhaps it was a clear warning that such use would irreversibly alter the nature of the conflict to his disadvantage.

Yet, the appeal of deterrence with conventional means alone is obvious, and it is an achievable dream, not an impossible one. If not now, then in the future when the range of conventional capabilities makes it possible. If this is so, then it requires our best efforts to make it a reality.

The Navy's interest in deterrence is not casual. Deterrence as a mission serves our nation's and our Navy's interests. Deterrence is arguably our most important peacetime mission, something we spend 90 percent of the time doing, and naval forces are major contributors to deterrence. This in no way takes away from the warfighting requirements of our forces. In fact, it is that **warfighting capability that underpins every deterrent action.**

Since current world and economic trends mean that there will be fewer of our forces overall and fewer stationed overseas, there is likely to be increased dependence on the Navy and Marine Corps for regional deterrence influence. So our conclusion is that emphasis on deterrence can be increased without taking away from the fundamental nature of the Navy and the Marine Corps as fighting forces.

Increasing our capability for, and practice of, deterrence would benefit us budgetarily and in our ability to shape the world security environment. So, while it is not yet time *to junk our nukes*, Ambassador Nitze's idea of deterrence with conventional means is on solid ground. In the Pentagon, the submariners of strategic nuclear deterrence fame are breaking new ground studying and gaming how to deter more effectively.

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SLBM, VIABLE FOR THE FUTURE

by William Watkins and
Edward Biggers
JWR Associates

The U.S. must continue to live with the nuclear weapon because we can't yet live without it. The arms control process continues to reduce the number of nuclear warheads held by U.S. and former Soviet (CIS) forces. This increases the percentage of total weapons held by other nuclear nations. Concurrently, nations that do not have them now are seeking to possess nuclear weapons in order to gain instant political prestige, regional influence and a decided strategic advantage. Meanwhile, the submarine launched ballistic missile (SLBM) on the fleet ballistic missile nuclear submarine (SSBN) *quietly* continues to carry out the critical role of protecting the U.S. against a nuclear threat. The changes in the nuclear posture of an increasing number of nations have begun to impact the ways the SLBM/-SSBN may be required to carry out its strategic role. A future expansion of the roles and missions for the SLBM/SSBN weapon system may be necessary.

For almost four decades the SLBM/SSBN combination has been a vital element in U.S. strategic nuclear deterrence. This survivable[1] sea-based element of the strategic nuclear triad served to reduce the incentives that existed for any principal threat[2] to conduct a nuclear first strike. As the SLBM evolved in capability,

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[1] Credit must be given to the SSN's who keep the Soviet attack submarine forces at bay, providing essential at-sea defense to the SSBNs so they could be truly survivable.

[2] The term principal threat was used during the Cold War to differentiate other potential enemies from the Soviet Union which had the means, intent and aggressive actions that placed the U.S., its forces and key allies in imminent danger of destruction.

it grew to provide a credible retaliatory threat to almost[3] the full range of Soviet targets. The SLBM force, in joint integrated operations with U.S. ICBM and nuclear capable bombers, provided an essential element of nuclear deterrence and a stabilizing parity with the nuclear forces of the Soviet Union.

The last ten years of arms control agreements and their implementation have impacted[4] near term and future SLBM/SSBN operational requirements.

Near term impact:

1. The number of allowable nuclear warheads has decreased. The alert status of nuclear-capable bombers and some ICBMs have been cancelled. Other ICBMs have been retired or downloaded. The net effect of these changes has been the extension of the targeting responsibilities and shift in alert requirements to the SLBM force. When Phase II of START II is implemented, SLBMs will assume up to 70 percent of the targeting requirements as dictated by the current[5] Single Integrated Operation Plan 94 (SIOP 94).

2. The Phase II implementation of START II requires a limit of 2160 SLBM operational warheads. If the U.S. maintains 18 SSBNS, the average out-loading of SLBMs would be five warheads per missile.

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[3] The exception was the ability to effectively target the Soviet Union's SS-25 mobile ICBM system. As the US SLBM system developed global range with high accuracy, threatening hardened, even buried targets, this limitation probably counter-balanced the U.S. SLBM survivability attribute in the minds of the Soviets that considered SLBMs to be a first strike weapon, no matter what the US said.

[4] It is recognized that the other triad elements, the bombers and the ICBMs have also been impacted.

[5] SIOP 94 represented a significant reduction in targeting requirements. To go beyond START II, future SIOPs must consider future significant reductions and/or change in targeting strategy.

3. If the effected de-targeting[6] is considered, the SLBM's flexibility could support a further reduction of strategic alert levels. This support is based on recent enhancement of connectivity and fire control upgrades which improved adaptive and flexible[7] targeting abilities.

Future impact:

1. The new strategic nuclear environment continues to unfold with its final form still very much uncertain. This uncertainty prompts many questions. What should strategic nuclear targeting cover? Should targets be hit, preemptively, in response to aggressive stimulation, or after we suffer damage? How is each target to be held at risk and with what systems?[8] The authors believe that the SSBN's inherent survivability characteristics and the recent flexibility to adaptively target and re-target suggest its utility in the support of a future SIOP.[9]

For the near term, the SLBM/SSBN continues to reduce the incentive of a nuclear first strike. Change in the intent of the principal threat allows the U.S. to concentrate less on offensive and more on retaliatory forces. However, this shift produces a challenge. Our credibility is being brought into question by both potential nuclear adversaries and allies on the extent of our willingness to retaliate with nuclear weapons, especially against a non-principal threat.

The longer term SLBM role in our nuclear deterrence plans

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[6] Bi-lateral targeting of open ocean areas was recently announced for some strategic systems as an approach to further reduce U.S. and CIS alert levels.

[7] Adaptive—ability to rapidly change targeting packages while on patrol. Flexible—ability to cover the full range and breadth of targeting responsibility.

[8] Conventional only, nuclear only or a combination?

[9] A recent Air Force document, *Nuclear Sufficiency in the 1990s and Beyond: White Paper, The New Strategic Equation*, AF/XOXXI, July 2, 1992, cites a future SIOP as one containing several, vice single, operations plans, thus reflecting the future requirement to hold at risk, only during periods of conflict, several potential, nuclear-capable enemies.

may be more prominent. A recent study[10] concludes that this survivable force precludes an attributable[11] nuclear strike against U.S. territory. The authors argue that as the U.S. progresses towards further nuclear arms reductions, the SLBM may have additional responsibilities.

The current approach to START II levels of nuclear disarmament is guided by essential requirements. 1) Strategic stability must be maintained while the strategic nuclear inventory and operational capabilities are reduced. 2) The existence of the U.S. must never be compromised. 3) The U.S. must be prepared to stop the re-emergence of any global nuclear hegemon.

Strategic stability in this new environment has broadened. It now must be defined as maintaining stability in three inter-related essential areas[12] simultaneously: crisis stability, arms control stability and deterrence stability.

Crisis stability is the maintaining of reduced incentives to conduct a first strike. This area has shifted focus from offensive forces that can launch on warning to retaliatory forces that can promptly deliver weapons.[13]

Arms control stability is the condition where no nuclear nation has the incentive to develop the technological breakthrough that will result in a significant military advantage. Stability in this area is maintained by the technological diversity of the strategic forces.

Deterrence stability is the condition where no nuclear power has the ability or incentive to employ its nuclear arsenal for coercive diplomacy. What it takes to maintain or improve stability

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[10] Future Deterrence Study, Deterring the Use of Weapons of Mass Destruction, Final Report, February 1993, Office of the Deputy Chief of Naval Operations for Plans, Policy and Operations N3/5, Strategy and Policy Division N51, Nuclear Affairs and International Negotiations Branch N514.

[11] More difficult to prevent may be a non-attributable nuclear weapon smuggled into the U.S. by a terrorist group sponsored by diffuse or covert sources.

[12] *The Coming Strategic Nuclear Debate*, Strategic Review, Summer 91, Colonel Richard Szafranski, USAF, p. 56.

[13] The retention of a small quantity of Minuteman III with the removal of its MIRV'd capability, is currently the system of choice for the prompt response role.

in this area is more complex and thus, the subject of current intense debate.

A recent study[14] suggests that to promote strategic stability the U.S. should maintain essential nuclear equivalence with the CIS. Overall strategic stability must be considered in the context of the developing strategic nuclear environment. To maintain strategic stability, the U.S. defense planners must integrate concerns of the U.S., CIS and other nuclear nations to maintain their individual strategic stability.

As the number of allowed weapons decreases, the disarmament process becomes more complex and more nations become involved. Some suggest[15] that targeting for mutual societal vulnerability may be the most appropriate[16] strategy. If adopted, this strategy would require no greater than 1000 allowable warheads. This 2/3 reduction cannot be accomplished without dramatic changes to the current U.S. strategic nuclear triad.

Without a principal threat there is no need for the U.S to threaten the first use of nuclear weapons. Some[17] argue that the U.S. should set an example by declaring a no nuclear first use policy. Others, including the authors, agree but contend that before the declaration is made, a complete analysis must be conducted to ensure there is no potential non-nuclear threat capable of holding the U.S. existence hostage. This declaration should also be used as a bargaining chip to get appropriate arms reduction and first use concessions from medium level nuclear powers.[18]

Vulnerable first strike weapons are generally considered

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[14] See footnote 10.

[15] Towards a Nuclear Peace, Center for Strategic International Studies, June 1993.

[16] Appropriate from the US point of view, the view of our allies and other responsible nations of the world, and what is intolerable to the adversaries.

[17] *Rethinking Our Defenses: Three Building Blocks of a New Strategy*, Les Aspin, December 31, 1991.

[18] Russia (recently renounced no nuclear first-use), Britain, France, China, maybe Israel. Not really medium level nuclear powers but beneficial to strategic stability would be the inclusion of India and Pakistan.

destabilizing.[19] A multilateral declaration of no first use coupled with the removal of vulnerable fixed site[20] ICBM weapon systems should help globally de-legitimize the first use nuclear option. This step should contribute to crisis stability and complete the U.S. retirement of one leg of the triad, with an attendant large cost saving.

Before this is accomplished, disadvantages must also be considered. Going to a dyad increases the risk of a technological breakthrough that counters the residual U.S. strategic capability. It further increases the exposure to a transient gap[21] in capability caused by a reliability or technical failure in one of the remaining systems. Removal of the U.S. ICBM force would also weaken our prompt nuclear response capability.

In rebuttal, with the continued absence of a principal threat, going to a strategic nuclear dyad may be acceptable. In a stable nuclear environment, characterized by reasonable levels of cooperation among medium-level nuclear nations, strategic warning should be greater than any transient gap. Further, a multi-lateral arms control process could provide sufficient incentives to all medium-level nuclear nations to maintain vice modernize their nuclear forces.

Weakening our prompt nuclear response capability, however, is viewed with some concern. Presently, several small nations are seeking nuclear weapon capabilities. Efforts by the U.S and others[22] to reduce proliferation of nuclear weapons and their delivery systems are currently underway. Success to date has been limited and some would argue that the means to guarantee success

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[19] *Deterring Through the Turn of the Century—The Discussion Group on Strategic Policy*, Harold Brown, Representative Les Aspin, Senator Sam Nunn, R. James Woolsey et. al., The Johns Hopkins Foreign Policy Institute, January 1989.

[20] Russia may not agree to removal of their SS-25 mobile ICBMs, viewing them as their survivable retaliatory weapons instead of their SSBNs. This is debatable but one must consider Russia making this decision on economic as well as military grounds.

[21] The time it takes to restore operational capability.

[22] The Nuclear Non-Proliferation treaty, Missile Technology Control Regime, et.al.

do not yet exist. As many small nations are vying for positions of power in the new world order, the desirability of possessing nuclear weapons as a deterrent against regional aggression and for status is high. Therefore, the potential for limited nuclear use is more probable today than it was during the Cold War. The U.S. must have a credible means, a counter-proliferation strategy and disabling capabilities, to preclude any nation from threatening to use its nuclear weapons against the U.S., its forces, vital, vital[23] interests or key allies. The prompt response option must be retained so its *hair trigger* characteristic will require an aggressor to consider the swift, almost automatic and devastating impact of a U.S. nuclear response.

If arms control is to go beyond START II, and fixed site ICBMs are eliminated, then the SSBN and/or bomber force must assume the prompt response mission. This capability can be incorporated into the SLBM/SSBN weapon system with minimal impact. Because the new strategic environment is characterized by a reduced open ocean ASW threat, the incorporation of a continuous, real-time, two-way, off-the-shelf communications between the National Command Authority (NCA) and SSBNs is now possible. Coupling this improved connectivity with a limited number of single warhead Trident I or II missiles makes a SSBN prompt response capability possible.

Any significant reduction of allowable weapons below the Phase II, START II will require the development of a new strategic nuclear policy. This policy must: 1) clearly state the objective of the U.S. nuclear force; 2) develop a new targeting strategy; and 3) define the roles and missions of the SLBM and bomber forces.

This can be accomplished by developing a set of strategic nuclear response[24] plans against the full range of possible nuclear threats. A new policy should contain the definition of a desirable nuclear end-state. This produces the following recommended policy goals:

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[23] Vital, vital interests are used to differentiate that of vital interests that some may argue have only political motivations. An example of this would be destruction of strategic oil reserves that would impact the US economy for a long time.

[24] Any particular response plan may include the use of conventional force.

1. U.S desire that nuclear weapons ultimately will become irrelevant as a war fighting tool.

2. U.S. intention to dispatch only non-nuclear forces to deter regional aggressions that threaten U.S. forces, allies or vital interests.

3. U.S. declaration of a no-first-use policy if similar statements are made by the nuclear-capable nations of the UN security council.

4. U.S. declaration that massive destruction of societies by means of these weapons, except in retaliation for a nuclear first strike, is not legitimate. A proclamation that there use will justify other nuclear-capable powers to demand the unconditional, immediate cessation of any sovereignty rights of the user.

During the transition to this nuclear irrelevant end-state additional operation limitations on U.S. nuclear weapon use must be considered. First, U.S. retaliation with nuclear weapons will be limited to protection against unacceptable levels of damage caused by follow-on nuclear attacks on U.S. interests, personnel or forces. Second, the distinction between U.S. tactical and strategic nuclear weapons must be eliminated to aid in reducing the legitimacy of battlefield nuclear-capable forces.

If U.S. tactical nuclear weapons are eliminated there still would be a future role for the tactical warhead. There are an increasing number of strategic shallow to deeply-buried, hard targets that require a level of destruction beyond the capability of present conventional weapons. The alternate use of high yield strategic nuclear weapons against these targets would result in an unacceptable[25] level of collateral damage. Without a technological breakthrough in conventional weapon yield to weight, there will be a future need for low-yield nuclear warheads to provide a measured

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[25] The U.S. military and leadership historically has followed principles and ethics of war fighting such as: War is an aberration and must be concluded with the minimum of pain and suffering on all sides. The U.S. military response should be commensurate with the level and type of threat.

nuclear response to first use of a nuclear weapon. A SLBM conventional strategic weapon, with its inherent high kinetic energy delivery, could be considered as an intermediate capability option for some hard target requirements. To illustrate, current conventional measured response option would not assure a timely immobilization of the aggressor's residual nuclear capability sufficient to effectively minimize follow-on U.S. losses.

Either the low-yield nuclear device or a conventional strategic warhead can be easily adapted into SLBMs or bombers. On SLBM missiles they can adaptively target any location on the globe. Stealth characteristics, mobility, variable attack azimuth and the potential for a short time of weapon flight would complicate any enemy defense capability. To illustrate the importance of these new strategic SLBM warheads, the following scenario is offered. Nuclear armed bombers flying to an aggressor nation are used as a mechanism to demand immediate, unconditional surrender after a limited nuclear strike against the U.S. At the last minute, the aggressor refuses to capitulate and it is determined that the predicted bomber losses due to enemy defenses will be unacceptable. A prompt NCA order to use these new SLBM weapons can be made, allowing a timely bomber recall, to minimize U.S. personnel losses.

In conclusion, the SLBM/SSBN continues to play a vital role in maintaining a stabilized nuclear deterrence against present and future threats to U.S. security. Our present strategic policy will be overcome by changes in the world environment. These changes include a continuing need for a nuclear arms reduction process, increased importance of the nuclear arsenals of medium-level nuclear powers and nuclear proliferation to non-aligned countries. Examination of future strategic policy, in the context of this new world order, show the SLBM as remaining central to strategic defense needs of this country. If the new strategic policy adapts the concept of a dyad vice triad, the SLBM will be required to do two things: 1) assume the new role of a prompt nuclear response system, and 2) incorporate the low-yield nuclear or conventional strategic warhead capability needed for special missions requiring a U.S. measured response. ■

THE JAPANESE KAITEN WEAPON

The Desperate Measure for Desperate Times

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Introduction

The Japanese word Kaiten means *heaven-shaker* and was given to a secret weapon used by the Japanese towards the end of World War II. The Kaiten was a modified torpedo carrying 3,000 pounds of high explosives and launched from the deck of a fleet submarine. As only one of several suicide weapons developed by the Japanese, a human pilot would guide the Kaiten weapon to its target. Although some believe the Kaiten was relatively successful during the last three months of the war, it was highly criticized from both an economic and a humanity standpoint. Not only was an expensive torpedo destroyed, but a valuable manpower resource as well. The Japanese industrial base was almost totally exhausted by the time Kaitens were employed and it was impossible to produce the amount of Kaiten weapons and mother submarines required to attain the expected results. More importantly, the loss of manpower deemed essential in the operation of the weapon, would not be replaced for an entire generation.

The mere concept of a suicide weapon was against the Japanese tenet of "Death in war is inevitable, but it should not be pointlessly courted". (Ito, page 162) The development of such weapons to include: the Kaiten, Kamikaze, Ohka (glider, Shinyo (motorboat), and Fukurya (swimmers) shows the desperation that the Japanese leadership felt knowing they had lost the war. The disaster at Midway was followed by substantial naval defeats in the Gilbert, Marshall, Solomons, and Marianas Islands and the threat of an invasion of the Japanese mainland was increasing each day. Most of their naval ships and aircraft carriers had been destroyed and along with them, their superior aircraft and pilots. Additionally, unlike the German U-boats in the Atlantic, Japanese submarines were employed poorly and made little contribution to the war.

The war was not going the way the Japanese High Command had planned and the suicide weapons were a last ditch effort *to bring about a tremendous change* and win the war. In fact, a

quote from one of the Kaiten inventors, illustrates the desperate thinking of the Japanese.

> "It must be obvious that the American fleet will have to use atolls for anchorages, for their westernmost large base is at Pearl Harbor! Now then, if the American fleet anchored in such atolls, what better weapon is there than a Kaiten for attacking these task forces? Just four submarines, carrying four Kaiten each, could be on the enemy before he suspected their presence, launch Kaiten, and retreat. The Kaiten would penetrate the atoll, and 16 enemy ships would be sunk at one blow. Imagine trying to dodge a weapon that is faster than any ship, especially when you are in a crowded anchorage. Our weapon could reverse the way this war is going. We could still win it!" (Yokota, page 33)

Unfortunately, the employment strategy proposed by the inventors yielded poor results for both the mother submarines and the Kaiten.

Even when it was obvious the Japanese would be defeated, they refused to give up. Instead they went to extremes to develop suicide weapons in hope that these weapons would change the outcome of the war. Evidence of this *never say die* attitude is shown in the Kaiten pilots wearing hachimaki (white bandanna) to signify relentless determination. Three aspects of the Kaiten—the weapon, the men and the results—let us better understand this desperate measure by the Japanese.

The Weapon

After the Japanese defeat in the Solomons, Lieutenant Junior Grade Hiroski Kuroki and Ensign Sekio Nishina, both pilots of midget submarines, conceived the idea of the *human torpedo*. Midgets were small battery powered submarines which carried only two torpedoes and participated in the attacks on both Pearl Harbor and Midway. Although the Imperial Japanese Navy considered them valuable weapons, they had many limitations: low speed, lack of maneuverability, ability to operate only near shores, and long launching time from the mother submarine. So Kuroki and Nishina concluded that what was needed was a better weapon—one that had more accuracy and high speed.

Fortunately for Kuroki and Nishina, Japan already possessed the oxygen-powered Model 93, Long Lance Torpedo. This potent torpedo could travel 22,000 meters at 50 knots and was never matched by the United States nor the British. While conventional torpedoes left an obvious bubbly wake, the Model 93 left no track.

> "A torpedo which had greater range than the biggest gun of a battleship provided the opportunity for a revolution in surface actions." (Ito, page 195)

The final design for the Kaiten weapon was completed in January 1943 and required a few modifications to the Long Lance Torpedo. These modifications included removing the warhead and inserting a pilot's compartment, a periscope and a set of controls. Then the warhead would be replaced and the torpedo reassembled. With these modifications, the Model 93 torpedo could be transformed into a secret weapon that was undetectable, powerful enough to sink a large ship and had precision control to the target.

With high hopes that their weapon would change the way the war in the Pacific was going, Kuroki and Nishina set off to sell their plan to the Japanese General Staff. They initially got nowhere. Prime Minister Kantaro Suzuki said

> "Using men in a situation where there is no chance of survival is not proper military operation. The Japanese Navy has always opposed such undertakings. (Ito, page 192)

However, as the war became more desperate and news of what Americans called the *Marianas Turkey Shoot* (the loss of over 400 Japanese planes in that engagement) reached the Japanese High Command, they finally accepted the suicide weapon. Realizing the Kaiten was inhumane, there was no apparent alternative—Japan's resources and industrial capability were almost exhausted.

Nearly 13 months after Kuroki and Nishina first approached the Japanese General Staff, their prototype design was finally approved. A secret base was set up on Otsujima Island in Tokuyama Bay, Yamaguchi Prefecture, with Lieutenant Commander Mitsuma Itakura as the first commanding officer. (Orita, page 232) Lieutenant Kuroki and Lieutenant Junior Grade Nishina, both

promoted, became the chief instructors as well as Kaiten pilots. Unfortunately, even before the Kaiten program was off the ground, disaster struck. Lieutenant Kuroki and another student Lieutenant Higuchi drowned when their Kaiten cracked and flooded after it took a sudden dip and struck bottom. The Kaiten was recovered and the bodies were cremated. Nishina vowed to carry Kuroki's ashes with him on the first Kaiten mission, which subsequently occurred near the Ulithi Atoll at 4:15 AM on November 22, 1944.

Although seemingly simple, the operation of a Kaiten was rather complex. Once a target was sighted, the submarine captain would order the Kaiten pilot to this weapon (a fleet submarine could carry up to six Kaiten). The pilot would enter his Kaiten weapon through a special hatch, which would then be sealed off. As the submarine closed on the target, relative position and other information would be passed to the pilot via a telephone. At the optimum moment, the Kaiten pilot would release the remaining two cables holding his torpedo in place and then start his engine. From then on, the Kaiten pilot was on his own. Using his single-eyepiece periscope, the pilot could make periodic spot checks of the target and correct his course if necessary. The pilot could control his speed by turning the oxygen valve overhead which regulated the oxygen flow to the engine. Additionally, there was a crank to regulate the rate of descent or climb underwater and a valve on the left for letting in sea water to maintain stability as the oxygen was used up. Finally, on the right there was a rudder control lever to steer the torpedo. Words from an actual Kaiten pilot, Yutaka Yokota, who survived the war, illustrate the complexity of the weapon:

> "A man had to have about six hands for operating a Kaiten. And about the same number of eyes for watching its control panel. There was an air-driven gyrocompass, a clock , a depth meter, a fuel gauge and an oxygen pressure gauge to keep an eye on, and that periscope was close by, always ready to gash your skull in if you moved too suddenly or knocked into some underwater object." (Yokota, page 63)

The Kaiten weapon, compared to the high tech weapons of today, was a crude machine which required a skilled pilot. However, the determined Japanese pilots were able to master the

complex controls in just a few underwater training sessions.

The Men

Japanese men were expected to fight, and die if necessary, for their country simply because it was their duty. It was Japanese tradition that no one ever received medals while they were still alive—the privilege of fighting or dying was enough. It is with this tradition that the Kaiten weapon was brought to life.

A total of 200 volunteers for the secret weapon were solicited from two naval air training bases, Nara and Tsuchiura. The men were not told what the secret weapon was, only that whoever mans the weapon would not return alive. The men were then asked to draw two circles on a piece of paper if they really wanted to volunteer, only one circle if they didn't really want to go at all. Because so many men volunteered to die for their country, they had to be screened. No married men were allowed and only the top 100 men from each base were accepted.

The volunteers arrived at the secret Kaiten base of Otsujima towards the end of August 1944, where 30 men were already in training (a second base at Kiari was created a few months later). Lieutenant Commander Itakura addressed the new recruits and showed them the Kaiten weapon. For security reasons, he instructed them to refer to the Kaiten as *maru roku kanamono—circle six metal fitting*. With that, classes began at once on the construction, maintenance and control of the Kaiten weapon. Due to the limited number of Kaiten training torpedoes, it would be some time before the new recruits would experience the thrill of operating one underwater.

The men, who had decided to die for their country, grew impatient waiting for their chance to prove themselves. When not out in a Kaiten, the men would practice how to estimate the range, course, and speed of a ship accurately, practice identifying American warships, participate in physical exercise and assist on torpedo boats. Anything to stay busy.

Japanese training methods would be considered harsh in American terms. Trainees were punched or slapped for making a mistake or forgetting to do something. Such methods are evident in Petty Officer Yutaka Yokota's account of an incident that happened after he had made a poor training run in his Kaiten:

"Lieutenant Hamaguchi (training officer) was full of rage

when I climbed out of the Kaiten and stood before him. You fool! he said, and punched my face. You fool! You could have killed yourself. Do you know what that would mean? It would mean you had given back the enemy one ship! How can we sink enemy ships if fools like you are going to kill themselves before they every go into action? Get out of my sight!" (Yokota, page 89)

Furthermore, the *Imperial Navy principle of mass punishment* was applied routinely. When one person made a mistake, then the whole group was punished.

Although training was harsh, the respect given to a Kaiten pilot was enormous. They were considered elite and had been granted the great privilege of dying for their country. A shrine was even built to honor them. On the eve of the first Kaiten mission, a special ceremony was conducted for the 12 men (four Kaiten each were attached to three modified submarines, I-36, I-37 and I-47). Vice Admiral Shigeyoshi Miwa, Commander of the Sixth Fleet, presented each man a short sword. The sword was an important symbol for Japanese fighting men. They must fight honorable to victory or use the sword to commit seppuka or what we call hara kiri.

"Once this sword was presented, a life was pledged for the Empire, either through battle death or disembowelment." (Yokota, page 44)

Following the ceremony, the officers held a party to honor the 12 heroes. Sake was poured and all enjoyed a fine traditional Japanese meal, even though, by late 1944 there was a shortage of everything. The next morning a band played the Japanese National Anthem while the Kaiten men boarded their submarines. Before boarding though, the men made sure all their earthly possessions including bits of hair and fingernail partings, were packed for shipment to their loved ones. As the men stood proudly on their Kaitens, a crowd cheered as the submarines moved out of the harbor.

Once the submarines were enroute to their targets, I-36 and I-47 to the Ulithi Atoll and I-37 to the Kossol Strait, the Captain's dilemma began. He had to provide some men the means for death, and the others a means for life. He would have to order

men to die and in a sense, become their executioner. Many agonizing moments were spent trying to come to terms with this dilemma. (Orita, page 240)

The night before the first Kaiten operation near the Ulithi Atoll, the men made their final preparations. They packed their spare uniforms, other belongings and wrote any last notes. One pilot wrote this note to his mother:

> "My hearts breaks when I think of how you will be provided for. Your words that one should die nobly for our country are strong in my mind as I leave on a mission from which there is no return. Please take good care of your self. (Ito, page 211)

These young men gave the ultimate sacrifice for their country dying with bravery and grace—they loved their parents, families and sweethearts and above all, their country.

Not all Kaiten were launched on the first mission, primarily because of mechanical failures. This was a great disappointment to the intense young men who were full of courage and determination. They returned to base in hope that they would go back out immediately with a new Kaiten in perfect condition. However to their surprise, once they returned to base, they were viewed as cowards. Yutaka Yokota gives another interesting account of the intense humiliation felt by the *returned* Kaiten pilots after a poor training performance.

> "The new executive officer slammed his bamboo pointer down on a table. You should be ashamed of yourself, Normura! he shouted. As for the rest of you, it is no wonder that one or two of you come back from each mission, without being launched at a target. What is your hachimaki for? And your sword! Doesn't it mean anything at all to your spirits? And the big send-off given you by all hands when you leave on a mission. These things are not done so that you can turn around and come back again! Once at sea, you must overwhelm the enemy! If anything goes wrong with you Kaiten, fix it! If the propeller won't spin, turn it with your bare hands! Crash into the enemy, no matter what! That's what the Kaiten is for! (Yokota, page 200)

After the announcement of the *unconditional surrender* of Japan on August 15, 1945, the remaining Kaiten pilots were in shock.

> "It is simply impossible for us, all dedicated men who had long ago offered to die for Japan, to accept the fact that our Emperor was now ordering to live." (Yokota, page 246)

They had seen their friends go off and die and felt that the surrender was a betrayal of them. They had no desire to live. Fortunately, an admiral who was concerned about the well-being of the human torpedo volunteers, devised a plan to form a farming force. He donated a piece of land, where all Kaiten men who wanted to retreat from the world, could join his force. Eleven men, all emotionally unsettled, tilled the land and planted crops until they were ready to make a new life for themselves.

The Results

When the Kaiten program ended, 88 pilots had been killed in action, with an additional 15 killed in training accidents. Additionally, eight submarines, with crews totalling over 600 men, were sunk while seeking the enemy for Kaiten operations. For this enormous loss of life, the Japanese Sixth Fleet estimated that Kaiten pilots were responsible for sinking between 40-50 enemy ships. However, only two U.S. tankers and one U.S. merchant ship can be confirmed by U.S. records.

There are many reasons why the Kaiten weapon failed to achieve significant results. First, like the Japanese submarine force, the Kaitens were ineffectively employed. Instead of attacking enemy shipping and sea lines of communications, they were initially employed against naval ships in well protected harbors. The enemy's anti-submarine warfare tactics and radar proved to be extremely deadly to Japanese submarines. Even if the submarine was lucky enough to survive a depth charge attack by the enemy, the Kaitens they were carrying were usually damaged. Additionally, the Kaiten's hull was only one-fourth of an inch thick and could not withstand the pressure of a deep dive. Thus, the submarine's defensive actions were severely hampered. Consequently, when the Kaitens were finally employed against enemy shipping, they achieved impressive results (note: results have not been confirmed by U.S. records). In the last three months of the war, nine submarines carrying Kaiten weapons sunk

15 tankers and transports, two cruisers, five destroyers, one seaplane tender, and six unidentified ships; and damaged two ships. (Ito, page 199)

Second, the Kaiten was a complex mechanical weapon, where lots of things could go wrong. Take for example I-36's maiden voyage. At the moment set for firing, the No. 1 and No. 2 Kaitens were stuck fast to their racks and No. 4 Kaiten was leaking oil. I-36 was only able to launch one Kaiten for the entire mission.

> "Of the 24 Kaiten sent out with the Kongo Group, only fourteen were launched at the enemy." (Yokota, page 55)

Electronic problems also plagued the Kaiten. Essential information had to be passed to the pilot over telephone lines when he was sealed inside his Kaiten and without the updated information the Kaiten could not be launched. Furthermore, once the Kaiten was launched, the possibility existed that one of the many controls or valves would malfunction and cause disaster for the Kaiten.

Third, there were not enough mother submarines nor Kaiten weapons. The Japanese lost a total of 130 submarines during the war and by August 1945, they only had seven operational submarines left—even the *heaven-shaker* could not change the tide of the war. At the time of the first Kaiten mission only three submarines were converted to carry Kaitens, the rest were being used to transport much needed supplies to stranded Japanese forces. Additionally, Kaiten torpedoes were in short supply which delayed actual *hands-on* training for most of the pilots.

Conclusion

The Japanese in World War II were convinced that the *human torpedo* would give them the advantage and that somehow they could still win. Having lost most of their military force in one disaster after another following Midway, the Japanese knew that defeat was at their doorstep, but they refused to give up. They chose instead to develop weapons with infallible control mechanisms—human pilots. It was the determined will of the Japanese people that allowed such a weapon to be developed, for it was considered a great honor to be selected to die for your country.

With a few modifications, Japan's superior torpedo, the Model 93 Long Lance, was transformed into a highly accurate, undetect-

able, and powerful secret weapon. The men endured rigid training to become respected heroes of the Japanese people.

The Kaiten could have achieved substantial results, had the Japanese employed them effectively, developed sufficient numbers of weapons and mother submarines, and been able to fix the mechanical problems plaguing the weapons. As it turned out, the Kaiten was *too little too late* to change the war in their favor.

Consequently, the Japanese desperate and inhumane effort to develop a secret weapon to change the outcome of the war was futile. It expended both scarce torpedoes and valuable manpower resources, without achieving any significant results. The patriotic men who volunteered as Kaiten pilots and the crews of the submarines that carried the Kaiten, died in vain.

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The 3rd Annual Subcommittee All-Submarine Model Competition will be held on Saturday and Sunday, 30-31 August 1994. For registration information, write to:

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DUTCH SUBMARINES IN WORLD WAR II
THE EUROPEAN THEATER

by CDR John D. Alden, USN(Ret.)

The German invasion of the low countries in May 1940 caught the Dutch submarine force unprepared for war. The country, although hoping to stay neutral, had initiated steps to strengthen its navy by authorizing a substantial shipbuilding program that included seven modern submarines, the O-21 to O-27, but their construction was far from complete. Although efforts had been made to expedite work on these submarines, two were still on the building ways, one was fitting out and not yet in commission, and the other four, although in commission, had not yet time to become combat ready.

The 12 serviceable submarines in Dutch ports ranged from the obsolescent O-8, a 343/443 ton former British H-Class boat built in 1916, to the brand new O-24. The O-9 to O-11, of 1925-26 vintage, were also small—483/647 tons—with a mixed armament of two 21" and three 17.7" torpedo tubes and a single 88mm (3.4") deck gun. The next most modern group, the O-12 to O-15, built in 1931-2, were of 546/704 tons and had five 21" torpedo tubes and two 40mm guns in unique disappearing mounts. The latest boats of the O-21 Class were technologically equal or superior to their contemporaries in other nations, with such innovative features as the first underwater air induction tubes or *schnorchels*. With the length of 255 feet and displacement of 881/1186 tons, they were heavily armed with eight 21" torpedo tubes—four forward and two aft in the hull itself and two on a trainable mount in the superstructure. They also carried an 88mm deck gun for surface action and two of the disappearing-type 40mm anti-aircraft guns. Because of the rapid but incomplete buildup of the fleet in both home and Far Eastern waters, trained and experienced personnel were still in short supply.

The German blitzkrieg overwhelmed the Dutch defenses in less than a week, and the naval base at Den Helder was overrun on 14 May 1940, trapping the old O-8, O-11, and O-12, and the incomplete O-25. Efforts to scuttle these boats were only partially successful. Similarly, the hulls of the O-26 and O-27 on the building ways were damaged by explosives but not so badly as to preclude their repair by the Germans. (The fate of the boats that fell into German hands is summarized in Appendix 1.)

Nine boats were able to escape to England, some under tow, in various stages of readiness. The O-9, O-10 and O-13 made brief patrols in the English Channel during the evacuation of Dunkirk, although not fully operational at that time. The O-13 was the first to set forth on a combat patrol on 12 June 1940, only to be lost on a mine in the Skagerrack a few days later, with her entire crew of 40. The modern O-21 and O-22 started patrolling in July, and the O-23 and O-24 in August and September, respectively. (Their schnorchels were found to be unreliable and were removed.) The older boats needed much work before they could be brought into service: the O-9 and O-10 in March 1941, the O-24 in August 1941, and the O-15 not until October 1942.

The early patrols of all boats were of relatively short duration and were concentrated in the North Sea, the waters around Norway, and the Bay of Biscay. They performed such tasks as reconnaissance, blockage of ports, convoy escort, and commando-type operations, but made few contacts. Only four attacks on German ships were reported, all unsuccessful, during these operations. Worse, the O-22 was caught off Norway on her fifth patrol and sunk on 8 November 1940 with all 43 crewmen by the German auxiliary subchasers UJ177 and UJ1104.

The first Dutch successes, all listed in Table 1, came when the surviving modern boats were shifted to operations in the Mediterranean, Ligurian, and Tyrrhenian Seas. The O-24 drew first blood, sinking the 6,600 ton Italian tanker FIANONA with a single torpedo. The O-23 soon claimed another Italian tanker, CAPACITAS of 5,479 tons. The O-21's first confirmed victim was the 5,738 ton Italian freighter, ISARCO, but her most spectacular success was in downing the German submarine U-95. However, after the Japanese invaded the Dutch East Indies these three boats were transferred to the Far East. (Their operations in that theater were described in the April 1983 issue of **THE SUBMARINE REVIEW**.

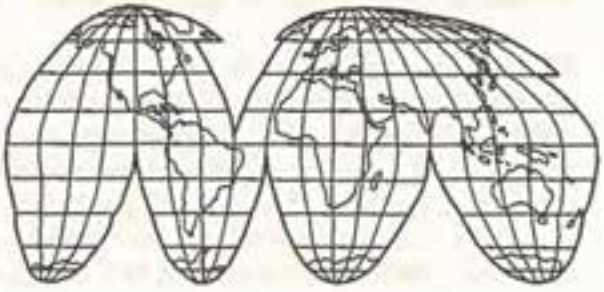
The older boats suffered from a shortage of torpedoes and spare parts as well as old age, and spent more and more time under repair. The worn out O-9, O-10 and O-14 were decommissioned after short periods of service and were scrapped in 1944; the O-15 was retired in 1944 but not scrapped until after the war. The demise of these boats made crews available to take over newer and more capable submarines that the British Navy was glad to provide.

The first of these was the DOLFIJN, the former U-Class P-47, which had a very successful career in the Mediterranean. Probably the most important of her 11 victims was the Italian submarine MALACHITE. Her skipper also intercepted another Italian sub, the CORRIDONE, on the way to port after Italy's surrender, and rammed the latter's stern planes to make sure she was really out of action. The DOLFIJN remained in Dutch service until scrapped in 1947.

The older British S-Class STURGEON became the ZEEHOND in 1944, but made only two patrols in northern waters, with no sinkings. This boat was returned to the Royal Navy in 1945.

The ZWAARDVISH (ex-TALENT), a larger submarine of the T-Class, also made three uneventful patrols in the North Atlantic before transiting to the Far East, where she enjoyed considerable success against the Japanese. A final boat, the TIJGERHAAI (ex-TARN), was completed too late to see action in the war. Both of these boats continued to serve in the postwar Dutch Navy until the 1960s.

A summary of the Dutch submarines' patrols in the European theater, with the names of their Commanding Officers, appears in Table 2. All told, they carried out 100 patrols, which included 32 special missions, and sank or damaged 21 enemy ships totalling nearly 54,000 tons—a highly creditable record for the submarine force of an occupied nation operating under serious material and personnel handicaps. ■



APPENDIX 1

Dutch Submarines Seized by Germany 14 May 1940

O-7 Decommissioned hulk; sank alongside pier at Den Helder 2 May 1944; raised and scrapped.

O-8 Ex-British H-6 (1916); commissioned as UD-1 21 November 1940 and used as trainer; out of service 23 November 1943; scuttled at Kiel 3 May 1945 and later broken up.

O-11 Captured 14 May 1940; never placed in service; sunk as blockship 1944.

O-12 Scuttled by Dutch; raised and commissioned as UD-2 28 January 1941; used as trainer; out of service 6 July 1944; scuttled at Kiel 3 May 1945 and later broken up.

O-25 Incomplete, scuttled by Dutch 14 May 1940; raised and completed by Germany; commissioned as UD-3 and made combat patrols 1942-3; on 26 November 1942 sank Norwegian freighter INDRA, 5041 tons; decommissioned 13 October 1944 after bomb damage and broken up.

O-26 Damaged on ways by Dutch; repaired and completed by Germany; launched 23 November 1940 and commissioned as UD-4 28 January 1941; used only as trainer; scuttled at Kiel 3 May 1945 and later broken up.

O-27 Damaged on ways by Dutch; repaired and completed by Germany; launched 26 April 1941 and commissioned as UD-51 1 November 1941; made combat patrols; on 29 October 1942 sank British freighter PRIMROSE HILL, 7,628 tons; surrendered to British at Bergen, Norway 30 May 1945; returned to Dutch and recommissioned as O-27 17 July 1945; decommissioned 14 November 1949.

TABLE 1

Dutch Submarine Successes in the European Theater

Date	Sub	Patrol	Target	Type	Tons	Results
12 Jun 41	O-24	7	Fianona	Oiler	6660	S
12 Jun 41	O-24	7	Carloforte	M/s	143	S
30 Jun 41	O-23	12	Capacitas	Oiler	5479	S
6 Aug 41	O-24	9	Bombardiere	Cargo	5613	S
7 Aug 41	O-24	9	Margherita Madre	M/s	296	S
16 Aug 41	O-23	13	Madalena Odero	Carlo	5479	D
5 Sep 41	O-21	13	Isarco	Carlo	5738	S
6 Sep 41	O-24	10	Carla	M/s	347	S
9 Sep 41	O-24	10	Italo Balbo	Caro	5114	S
3 Oct 41	O-21	14	Oued Yquem	Cargo	1369	S *
22 Nov 41	O-21	15	San Salvatore	M/s	92	S
24 Nov 41	O-21	15	Unione	M/s	216	S
28 Nov 41	O-21	15	U-95	SS	769	S **
9 Nov 43	DOLFIJN	4	Malachite	SS	615	S
29 Mar 43	DOLFIJN	9	Sebbia	Cargo	5788	S
4 Jul 43	DOLFIJN	9	Adalia	Sch	165	S
13 Jul 43	DOLFIJN	9	Stefano Gallisano	Sch	164	S
11 Sep 43	DOLFIJN	11	Humanitas	Cargo	7980	S
13 Sep 43	DOLFIJN	11	Unident	Barge	250	S **
13 Sep 43	DOLFIJN	11	Unident	Barge	250	S **
17 Apr 43	DOLFIJN	17	Agios Georgios	Caique	75	S
17 Apr 43	DOLFIJN	17	Hydra	Caique	129	S
17 Apr 43	DOLFIJN	17	Theonie	Caique	6	S

Notes:

All attacks above were in Mediterranean; all ships Italian except as noted below. Not listed are two unidentified ships reported damaged by O-21: an Italian cargo ship on 29 July 1941 and a schooner on 3 August 1941.

M/s = motor sailing vessel

* Vichy French

** German

TABLE 2

Dutch Submarine Commanding Officers and Patrols in the European Theater

O-9	Ltz 2 H.A.W. Goossens (3 patrols 29 May 40 - 25 Dec 41)
O-10	Ltz 1 KMR G. Quint (1 patrol 29 May - 1 Jun 40) Ltz 2 J.H. Geijs (1 patrol 29 Mar - 5 Apr 41) Ltz 2 D.Th. Baron Mackay (5 patrols 16 Dec 41 - 16 May 43)
O-13	Ltz 1 E.H. Vorster (2 patrols 29 May - lost ca 13 Jun 40)
O-14	Ltz 1 KMR G. Quint (5 patrols 13 Aug 41 - 5 Feb 42) Ltz 1 H.A. W. Goossens (3 patrols 21 Mar 42 - 6 Jun 43)
O-15	Ltz 1 KMR G. Quint (1 patrol 23 Oct - 18 Nov 42) Ltz 2 A.J. Schouwenaar (6 patrols 23 Jan 43 - 24 Jan 44)
O-21	Ltz 1 J.F. van Dulm (17 patrols 30 Jul 40 - 20 Aug 42) (thence to Far East)
O-22	Ltz 1 J.W. Ort (5 patrols 3 Jul - lost 11 Nov 40)
O-23	Ltz 1 G.B.M. van Erkel (2 patrols 18 Aug - 22 Sep 40) Ltz 1 A.M. Valkenburg (2 patrols 18 Aug - 19 Nov 40) Ltz 1 G.B.M. van Erkel (9 patrols 18 Dec 40 - 20 Aug 41) (thence to Far East)
O-24	Ltz 1 O. de Booy (12 patrols 20 Sep 40 - 23 Dec 41) (thence to Far East)
DOLFIJN ex-Br P-47	Ltz 1 H.M.L.F.E. van Oostrom Soede (18 patrols 15 Nov 42 - 7 Jun 44)
ZEEHOND ex-Br STURGEON	Ltz 1 D.Th. Baron Mackay (2 patrols 17 Feb - 23 Mar 44)
ZWAARDVISCH ex-Br TALENT	Ltz 1 H.A.W. Goossens (3 patrols 28 Feb - 29 Mar 44) (thence to Far East)

USS TRITON: THE ULTIMATE SUBMERSIBLE

Part II: The TRITON in Service

by Robert Largess

TRITON was laid down on 29 May 1956, launched 19 August 1958, and commissioned 10 November 1959. Meanwhile SKIPJACK was laid down the same day, launched 26 May 1958, and commissioned 15 April 1959. TRITON's successful competitor in the role of high speed submarine was quickly overtaking her. GEORGE WASHINGTON, laid down as SCORPION on 1 November 1957, was launched 9 June 1959, and fired her first Polaris missiles in July 1960, supplanting TRITON in a major role for the very large submarine. Indeed, TRITON's progress was slowed as resources and design staff were diverted to her competitors.

When launched, she was a strange combination of the conservative and revolutionary. She was the last American submarine built with an extensive external superstructure or *casing*, twin shafts and screws, conning tower and stern torpedo room. But her most unusual feature, even more than her twin reactors, were the lines of her hull.

Whereas submarines use power to overcome surface drag, or friction, and form drag, or turbulence, surface ships lose power to a third factor—wavemaking. (Where in submarines horsepower requirements rise at the rate of roughly the cube of the speed, that of surface ships rises above 30 knots at a power of seven.) To minimize this, the hull of the fast surface ship is designed according to principles very different from the streamlined pure submarine. Hence TRITON's knifelike upper bow and tremendous *fineness* (length to beam) ratio. At 12:1 TRITON's is greater than that of practically any destroyer, usually between 10 and 11:1. Her bulbous forefoot at the base of her stem creates a flow pattern which cancels out her bow wave.

Her official specifications are 447-1/2 ft. length, 37 ft. beam, 24 ft. draft, and a surface displacement of 5,940 tons, 6,670 tons submerged. Ned Beach suggests the latter figure is really considerably higher—at least 7,900 tons—and points out that it gives the truest indication of just how large TRITON is. The difference between surfaced and submerged displacement basically is determined by ballast tankage. The typical modern pure submarine has relatively little, and thus little reserve buoyancy on the

surface. She is intended to submerge, and stay submerged: the last concern is how she behaves when surfaced. But TRITON required substantial reserve buoyancy to behave like a proper surface ship at destroyer speeds.

How fast was she? Usually she is described as having top speeds of 27 knots surfaced, 20 submerged. Ned Beach says it was hoped to get 30 on the surface but only 27 was achieved at first. He says that Admiral Rickover directed that shaft horsepower be increased by increasing the reactor's power output. This was carefully increased in small increments until TRITON was *well over 30 knots*. Unfortunately this never earned her the title of fastest submarine in the world as SKIPJACK had already exceeded this submerged. None of TRITON's COs volunteered a figure for her top speed submerged but one suggested it was nearly as high as her surface speed and another described her as faster submerged than any other nuclear boat of her day except SKIPJACK.

There are several astoundingly beautiful photos of TRITON on her trials, clipping through the waves like an arrow, kicking up spray and training a monstrous wake. But even if one grants that it was possible to build a sub that could imitate a destroyer, was there any point to it?

Perhaps. The schizophrenic nature of defense thinking in the 1950s must be remembered. The USN projected power around the world very successfully with WWII weapons, yet the potential future threat of nuclear attack loomed as a seemingly insoluble dilemma. Many commentators, popular and professional, speculated that the atomic bomb would sweep surface fleets from the sea; only the nuclear submarine could survive. Nuclear submersible cargo carriers, landing ships, air defense missile ships, and aircraft carriers were urged in the defense literature of the day. The Navy undertook a serious design study of a submarine aircraft carrier. How much of a role these ideas played in the building of TRITON is unknown, but in fact, she was the nearest thing to the nuclear submersible warship to become reality, and she proved that it could be done very successfully, if not cheaply.

Actually TRITON's only real predecessors were the British steam powered K-Class submarines of World War I. These ships carried a long superstructure on top of a long, low submarine hull. There was a bridge and stacks projecting above that superstruc-

ture. Resembling submersible destroyers, they carried three guns, above-water torpedo tubes and even depth charge throwers. These first *fleet submarines* had a top speed of 24 knots, enabling them to accompany the Grand Fleet. Their mission was to position themselves to intercept an enemy fleet and attack it submerged, or perhaps scout for the fleet in weather too bad for destroyers.

They were dogged with numerous problems, and one of them was surface sea-keeping. At their remarkable top speeds, they dug their bows in, inundating their decks, throwing cascades of water over their upperworks, rendering them almost untenable and their impressive surface weaponry unusable. Eventually, most of the weapons were removed, the remaining guns were mounted on top of the superstructure, stacks and bridge were raised an additional level, and they were given huge raised bows to provide the buoyancy necessary to ride over waves and the flare to direct spray off decks.

TRITON was also given the hull and engines to make high surface speed, but not the sea-keeping features necessary to use it comfortably. Captain Beach says as she reached high speed on her trials, she immediately drove her bow under. "Her extremely slim bow had most of its buoyant volume well aft, at precisely the point where the maximum hollow of her bow wave occurred at high speed." The only exposed men and equipment aboard TRITON were nearly 30 feet up at the top of her sail. But at 30 knots, this was not enough. With a foot or two of freeboard at her bow, she would punch through waves, which would burst with a cascade of spray against the bottom of the sail, choking and blinding her bridge watch. The immediate solution was to increase the volume of her bow buoyancy tank without changing her external lines; but Captain Beach says he recommended giving her a flared bow.

Another solution he recommended was giving her a small hydrofoil under her stem to lift her bow up at speed. He tried the experiment of rigging out her bow planes on the surface. This brought her bow right up but as speed increased, she began to lift out of the water, then crash back, threatening to damage the planes.

Around the World Submerged

Almost immediately after commissioning, however, she proved her worth as a true submarine, circumnavigating the world

submerged on her shakedown cruise. This was described in detail in Ned Beach's Around the World Submerged. This feat marked the end of the transition period beginning with NAUTILUS. Before, submarines were good for about 100 miles on battery; afterwards, the 2-3 month ballistic missile patrols became a routine reality. Where PICKEREL set a record in 1950, covering 5,194 miles in 21 days of continuous snorkeling, SEAWOLF spent 60 days submerged in 1958, covering 13,761 miles. TRITON covered 41,500 miles in 83 days, largely at a steady 21 knots.

Did this feat overcome any major psychological hurdle? The quality of her engineering was apparently very, very good if not perfect; more to the point, none of the problems that occurred was beyond the ability of her very highly qualified crew to handle.

Operational Career

Having made herself famous, what did TRITON do for the remainder of her service life? This was the biggest question mark, and this writer still can't answer it completely.

First, was she ever used in the radar picket role? Yes, briefly. In 1960 and 1961 her radar picket facilities were tested and exercised off Norfolk and in the North Sea. She performed air control duty for fighter-interceptions and demonstrated her ability to operate with the fleet, sustaining its 18 knot speed of advanced for a week at a time. Captain George Morin, who relieved Ned Beach, said however that he never operated her in this fashion. He describes TRITON operating between the carriers and their target and using her air control facilities for strike control. The aircraft homed in on TRITON—operating **submerged**—and she then vectored them in to the target.

She lost her SSRN designation 1 March 1961, and her complement was reduced from 16 officers and 156 men to 13 and 145.

Was she actually considered and used as an attack submarine, and if so, how did she perform on that role? Captain Morin said "Yes, she was employed in regular attack boat roles until her June 1962 to March 1964 overhaul." There are many, many conflicting opinions of her performance submerged, quietness and maneuverability in particular. They range from *excellent* to *terrible*. It is probable that she outclassed her ASW competition but was inferior in these respects to the other attack boats of her day. Captain

Morin noted that due to her great length, a 2° down angle at periscope depth would put her stern on the surface.

Captain Beach noted two problems during her construction. In spite of her two torpedo rooms, poor design left her able to accommodate no more than 16 Mk 37 torpedoes, a very modest load. And giving her a conning tower left the captain separated from all the fire control equipment in the control room, a condition the elimination of the conning tower in the TANGs and NAUTILUS was intended to solve. Beach suggested removing the big radar and extending the conning tower in 1961 but it wasn't done.

The conning tower and great height of her sail increased her periscope depth and probably helped operating her radar submerged or broached. She used the later maneuver repeatedly, breaking the surface with only the top of her sail to transfer personnel during the circumnavigation. Captain Frank Wadsworth, her fourth CO, used her this way, sail breaking the surface, so he could operate with antennae extended at higher speeds than he could do completely submerged.

During her career TRITON was used to test the radio communications buoy which became standard on the SSBNs, and several versions of SINS, a breadboard version during her circumnavigation (which didn't work) and a huge Sperry version later. A variety of possible roles suggested for her included: high speed minelayer, guided missile ship, advanced sonar scout for the surface fleet, command ship, and rescue tug for nuclear submarines disabled under the ice cap. Captain Beach describes in detail his ideas for this in his novel Cold is the Sea: a grapnel would be extended through a stern tube to hook the disabled sub's anchor chain. TRITON would have had not only the stern tubes but also twin screws for safety and maneuverability in tight quarters.

TRITON was prepared for under-ice operations during her overhaul but never used for them. The only one of these ideas actually tried was for a command ship. Although she was often described as a possible command post for the President during a nuclear war, the actual role she was tested in was as command ship for the Atlantic Submarine Force. The air control space was equipped for COMSUBLANT and his staff. Captain Morin says they tried controlling a group of subs with part of the staff aboard but it proved very awkward. The Soviets apparently believe

strongly in tactical cooperation by submarines but it is an open question how well they made it work.

But was TRITON a white elephant or a valuable unit? Her last two COs, Captain Robert Rawlins and Captain Frank Wadsworth told me unequivocally that TRITON performed very important and valuable service during the years 1964 to 1968.

Plainly an essential part of her task was her former air control center. She possessed a huge CIC just like a surface ship's. It was never really used as a CIC but provided a lot of flexibility for placement of additional electronics as other Cold War missions were found for her.

Why was the TRITON's second refuelling scheduled for 1968 cancelled? Many reasons probably contributed; as a *one-off* the cost of spare parts and upgrading engineering manuals became prohibitive. Her system of loading reactor fuel elements was also unique; although designed to be refueled from a tender, this was never attempted. Ned Beach notes that FORRESTAL had just suffered a disastrous fire, and the cost of her repairs exactly matched that of TRITON's cancelled refuelling and overhaul. ■

**** IN REMEMBRANCE ****

CAPT Charles C. Baldwin, USN(Ret.)

CAPT Curtis W. Bunting, USN(Ret.)

VADM F.J. Harlfinger, USN(Ret.)

CDR Forney H. Ingram, USN(Ret.)

CAPT John George Now, USN(Ret.)

RADM Richard H. O'Kane, USN(Ret.)

CAPT Richard Z. Test, USN(Ret.)

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Electric Boat Division, Groton, CT.

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GENERAL DYNAMICS
Electric Boat Division

THE SUBMARINE REVIEW

THE SUBMARINE REVIEW is a quarterly publication of the Naval Submarine League. It is a forum for discussion of submarine matters. Not only are the ideas of its members to be reflected in the REVIEW, but those of others as well, who are interested in submarines and submarining.

Articles for this publication will be accepted on any subject closely related to submarine matters. Their length should be a maximum of about 2500 words. The content of articles is of first importance in their selection for the REVIEW. Editing of articles for clarity may be necessary, since important ideas should be readily understood by the readers of the REVIEW.

A stipend of up to $200.00 will be paid for each major article published. Annually, three articles are selected for special recognition and an honorarium of up to $400.00 will be awarded to the authors. **Articles accepted for publication in the REVIEW become the property of the Naval Submarine League.** The views expressed by the authors are their own and are not to be construed to be those of the Naval Submarine League. In those instances where the NSL has taken and published an official position or view, specific reference to that fact will accompany the article.

Comments on articles and brief discussion items are welcomed to make the SUBMARINE REVIEW a dynamic reflection of the League's interest in submarines. The success of this magazine is up to those persons who have such a dedicated interest in submarines that they want to keep alive the submarine past, help with present submarine problems and be influential in guiding the future of submarines in the U.S. Navy.

Articles should be submitted to the Editor, SUBMARINE REVIEW, P.O. Box 1146, Annandale, VA 22003.

A MOST SILENT SERVICE: THE SWEDISH SUBMARINE FORCE

by CAPT Jarl Ellsén, RSwN(Ret.)

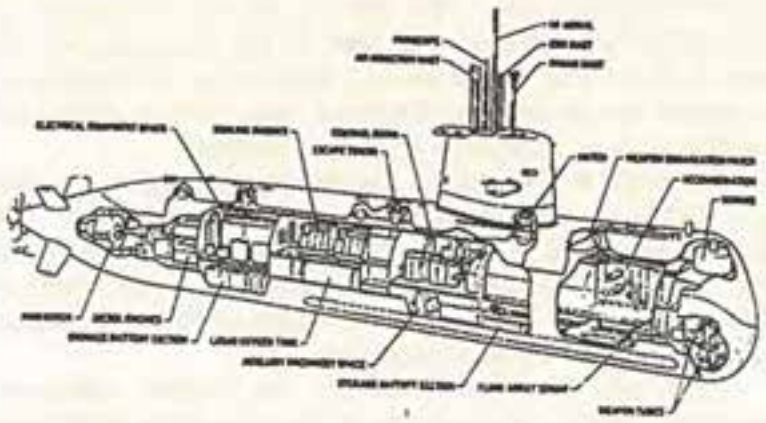
As a member of the NSL I always read **THE SUBMARINE REVIEW** with great interest.

I have, however, found that the knowledge of the Swedish Submarine Force is somewhat lacking. Obviously we who are associated with the Swedish Navy are very poor PR people. Our submarines belong perhaps to the most silent service in the world!

The Dutch Navy is far better in the PR department. Last year they sent one of their newest submarines on a goodwill tour to the US east coast and thus got a long, interesting article about their submarine force in **THE SUBMARINE REVIEW**.

In the October issue was an article about the new Australian submarines, the COLLINS Class. An informative article indeed, but unfortunately the Australian author forget to mention that the submarines are constructed on drawings made by the Swedish submarine manufactory Kockum's Submarine Systems, who also built the first one-third of the first boat in the building halls in Malmö, Sweden. In Adelaide, Australia the COLLINS Class in general are built by the Australian Submarine Corporation, 50 percent owned by Kockums. The contract was awarded after hard competition with the world's leading builders of diesel subs.

The new Swedish GOTLAND Class, now building, stood as a



GOTLAND Class

model for the COLLINS Class, although the latter is double in size and specially constructed for operations in the vast areas outside Australia.

Not only is the GOTLAND hull of Swedish construction but also its command and control system is *homemade* by the Swedish firm CelsiusTech. This system, modified for surface craft, was purchased by the Australians for their new frigates, the ANZACS.

As an attack submarine, the GOTLAND is armed with the latest in torpedo technics. Both the new light ASW torpedo 43x2 and the new heavy one, Type 2000, are wireguided and homing. They were designed and are produced by Bofors Underwater Systems, in Motala, Sweden.

It is, therefore, appropriate to offer a few remarks on Sweden's tradition in submarines. The Swedish Navy was in fact one of the first that procured submarines. The young naval architect, Carl Richson, was sent to the USA to study submarines at the John P. Holland factory in 1900. In 1904 the first sub HAJEN (Shark), a construction of Richson's, was launched by the Stockholm Navy Yard. She was shortly followed by three sister boats. Thus Sweden was ahead of Germany!

The HAJEN had a displacement of only 107/127 tons and the Navy wanted bigger boats that could operate in open sea. In 1907 a 400 tonner was ordered from Italy and in 1909 she took the long trip to Sweden, a heroic task in those early years. After that, all following subs were designed and built in Sweden.

As the waters around Sweden's 2700 km coastline are very shallow (average 300 feet), the Swedes have been experts in that type of operation areas. They did not take part in activities of either world war, although one 800 ton sub was sunk with all hands in World War II after hitting a mine laid by the Germans in an exercise area inside Swedish national waters, which at that time extended out only three miles from the shoreline.

After the 1939-1945 war, the Swedish Navy salvaged a German type XXI boat and obtained very good information of this advanced submarine by cutting it into pieces. Some years later a new SHARK was launched at the Kockums yard, a *Guppy* type of 750 tons. That was the start for the modern building programme that up to this day has been successful.

I think that Tom Clancy has put the Swedish submarine situation of today rather clearly in his new book Submarine (1993). He says:

"Of all nations that operate submarines, none is probably less understood and more underestimated than Sweden. The Swedes have always had an independent streak when it comes to defence issues, and this is certainly true of their submarine force. At the moment they produce some of the most advanced conventionally powered submarines in the world. Their boats have a decidedly inshore design philosophy, consistent with the Swedish requirements of operating in the Baltic. In addition the Swedes are leaders in non-nuclear air independent propulsion (AIP) systems. Currently they are finishing the development of the GOTLAND (A19) Class boats, equipped with a Sterling AIP system to keep the batteries charged for longer submerged endurance. Like all other nations, the Swedes are aggressively marketing their boats for export (but obviously not in the USA! (This is the author's remark.)) They have had a particular success with the sale of six boats to Australia."

Concerning AIP systems, the Swedish Navy, during the 60s, thought of and started some construction on a nuclear powered submarine but studies showed that the boat would be far too big for operations in the shallow waters of the Baltic.

The next Swedish submarine construction effort, the Type 2000, is moving through the Swedish *BuShips* and the Kockums Company. The aim is to make her extremely stealthy to sonar transmissions, with very long submerged endurance (AIP), and of still better capability for littoral operations.

Many articles in **THE SUBMARINE REVIEW**, Naval Institute Proceedings, and other US journals deal today with submarine operations in littoral waters. Since the Swedish Navy has conducted intensive operations against foreign intruders in their own littoral waters during the last ten years, they may have some assistance to offer in these matters. ■

BRING BACK THE MIDGETS!

by Tom Hunter

On the night of December 9, 1917, fast motor torpedo boats of the Italian Navy raided the Austrian port of Trieste, sinking the coastal defense battleship WIEN. This assault highlighted a year which would witness the sinkings of various other Austrian warships and drive the embattled Austrian Navy to bottle up what was left of its fleet in the well-defended and fortified home port of Pola. Here, it was felt, they could regroup and plan in safety, out of reach of the dreaded Italian raiders. The Italians learned of this and undertook a plan of their own.

In the early morning hours of November 1, 1918 two swimmers, Major Raffele Rossetti and Surgeon Lieutenant Raffale Paolucci, guided what was essentially an old 14" bronze torpedo through the nets and barriers of the harbor entrance. In time, they reached the YUGOSLAVIA, which only a few days before had been the flagship of the Austrian Navy, VIRIBUS UNITIS, whereupon they disconnected a detachable warhead. The mother torpedo, now unladen save its own internal warhead, was pushed off in the direction of another large shape, also named a transatlantic liner WIEN. In the meantime, the two swimmers went to work attaching the first warhead to the side of the massive battleship. Off in the darkness, the torpedo motored under its own power for a short distance before slamming into WIEN, whereupon the remaining warhead detonated and tore a gaping hole in the side of the hapless liner.

It was then that sailors aboard UNITIS, now alerted by the attack on WIEN, spotted the two divers and took them aboard as prisoners. Fifty feet below their feet, the last seconds ticked off the bomb's timer and, according to Paolucci, "a dull noise—a deep roaring" rumbled through the steel bulkheads of the battleship, followed by a "high column of water".[1] *Within minutes, the ship that had been the pride of the Austrian fleet, her hull opened to the Adriatic, capsized and sank.*

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[1] John E. Moore, Submarine Warfare: Today and Tomorrow, Adler and Adler, USA, 1987, p. 204.

This dramatic example can be said to be the birth of the mini-submersible at war. Prior to this, submarines were indeed diminutive in comparison to today's monsters, but they represented the height of technology and not a distinct desire to develop something small and stealthy. Today, midget submarines, hereafter referred to as minisubs, are known to be operated by Columbia, Libya, North Korea, Pakistan, Yugoslavia, Sweden, and South Korea among others.[2] Evidence has also been accumulating in the form of undersea tracks along the coasts of Brazil and Sweden that indicate that the Soviets are more than likely operating some form of tracked minisub.[3]

The United States, to date, operates only small submersibles, called SDVs, or swimmer delivery vehicles, for use strictly by naval Special Operations Forces (SOF). In an era when the world seems to be changing to meet the times, only the United States lags behind in resurrecting the potent power of the mini-submersible.

When a brushfire war, or regional conflict erupts, it has always been a submarine that has arrived on the scene first. With diverse operational areas and unlimited range, they are the ideal platform for first response. And what can a submarine do when it gets there? Just about anything it wants. From intelligence gathering to tactical cruise missile strikes, and from covert insertion of troops ashore to mine warfare, the submarine is a jack-of-all-trades. Yet, there are occasions[4] when the mini-submersible would be better suited to some of these tasks, at much less risk, and much less cost.

Today, when the word submarine is brought up, visions of Soviet TYPHOONS and American LOS ANGELES Class attack subs come immediately to mind. So it would seem in the minds of those responsible for the security of ports and harbors worldwide. Some ports, especially those directly related to military operations, are wired for sound; others make use of magnetic

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[2] Ernest L. Schwab, Undersea Warriors: Submarines of the World, Publications International, Ltd., Yugoslavia, 1991, pp. 244-249.

[3] Moore, p. 222.

[4] ...*From the Sea*, The Department of the Navy, 1992.

anomaly detection gear. Some are considered too shallow and cramped for a submarine to enter and remain underwater. Routine anti-submarine patrols are carried out around major coastal military bases, all of whom are looking for that hulking black shape in the darkness (successful or not, their eyes are open).[5] In any event, the defensive measures taken will be geared towards keeping a full-sized attack sub, with its dreaded torpedoes, out. Yet, it has been proven that small craft with SOF teams are scarcely slowed by such measures. (Note the results obtained by U.S. Navy SEAL Commander Richard Marcinko and his Red Cell team during the simulated terrorist attack on the Submarine Base at New London, CT.)[6] Now is the time for the minisub, a weapon for which there is no established defense.

During World War II, the mighty German battleship TIRPITZ, known to be moored somewhere in the fjords of northern Norway, threatened all Allied relief convoys between Europe and Russia. Oddly, she accomplished this not by her actions, but rather "simply by sitting in Altenfijord at North Cape, posing a potential but continuous threat to any ship which attempted the Murmansk run".[7] *So seriously was this threat taken, that during the summer of 1942, all convoys to Russia were halted, despite their desperate need on the other end. Needless to say, her destruction was accorded the highest priority by the Allies, and especially the British. Thus, repeated bombing attacks were carried out against her, with little to no success. The British were confounded. When they finally did locate her, they had to quickly assemble a fleet, equipped with an aircraft carrier, race up to within striking distance, then hope that one of the small bombs would score a*

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[5] Given the superiority of Western submarines against most ASW measures, the fact that a submarine can operate with near-impunity in any open-ocean scenario is granted. However, when operating in the littorals, missions requiring near-surface activity are the norm rather than the exception. Thus, the invulnerability factor becomes an issue to be reconsidered rather than taken for granted.

[6] Richard Marcinko, Rogue Warrior, New York, Pocket Books, 1992, pp. 289-293.

[7] Barry Pitt, The Military History of World War Two, New York, The Military Press, 1986, p. 156.

lucky hit. Torpedoes were useless, as TIRPITZ was often surrounded by more than one torpedo net. Another way had to be found. From this dilemma, the X-craft was born. Originally designed in 1941, the 30 ton midget submarines housed a crew of four, along with four two-ton explosive packages. They were 51 feet long and a little over five feet in diameter. As testimony to the bravery of their crews, the reduced size of the craft enabled only a one-half inch pressure hull between the sailors and the ocean. It was six of these vessels, towed by six larger T and S Class submarines of the British Royal Navy that comprised the assault force against TIRPITZ. They departed on September 11, 1943 from their berth at Loch Carnbaw in Northern Scotland and arrived at their rendezvous point at Kaafijord in Norway on September 22. The journey was not without its hazards, and they lost four of the six craft enroute to various causes.

And so it was only two X-craft that breached the anti-submarine defenses of Kaafijord. Unnoticed, they pulled up beneath the massive black hull of battleship and released their delayed action mines. Within minutes, the charges detonated and fractured the spine of TIRPITZ. The X-craft attack proved successful and caused considerable havoc: the rudder was damaged, all three propeller shafts were bent and some turbines were unseated from their mountings; cracks in the bottom caused floodings and even the rear 38 cm gun was dislodged from its foundation.[1] *As a result, the vital convoys to Russia were able to resume, and TIRPITZ never put to sea again.*

Intelligence Gathering

Going to extraordinary lengths to obtain information has proved a necessary task over the years, and with the advances being made in secure communications procedures and protection of information, it follows that the ability to take advantage of such opportunities is one we should continue to develop. Technological advances, however, have also brought about improvements in the way in which such transmissions and signals can be intercepted. Now, a specially equipped submarine can poke up any one of a variety of periscopes or masts and retrieve information from the enemy.

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[1] Jak Mallmann Showell, The German Navy in World War Two, Annapolis, Naval Institute Press, 1979, p. 102.

Also, cameras installed in the periscope can, within minutes, obtain detailed photographs of coastlines and shore installations, without risking the lives of SEALs or other valuable assets. The addition of such surveillance gear to a minisub would create the perfect tool for such a mission.

Insertion and Exfiltration of Special Operations Forces

During Operation Desert Storm, U.S. Navy SEALs carried out missions as diverse as "strategic reconnaissance, early warning patrols along the Kuwaiti border, hydrographic reconnaissance, direct action missions, mine hunting, and combat search and rescue".[9] With the advent of the SDV, covert insertion techniques improved dramatically. However, the obvious problem remained. How to get commandos ashore, with their gear, through hostile waters, undetected, over long distances, and back again. That problem was addressed with the *piggyback*.

Both the USS SAM HOUSTON and USS JOHN MARSHALL *[Ed. Note: Both ships are now out of commission and have been replaced by KAMEHAMEHA and JAMES K. POLK.]* have been fitted with large dry shelters on their decks which are used to house SDVs. The problem with this is that it requires placing the *mother* boat dangerously close (within a few miles) to a hostile shore. This usually does not present a problem during the insertion phase when all is generally calm, especially because the sub can head out to sea for a time if it wishes. However, during extraction, the story may be much different. If, for example, the SEALs have caused a commotion during their visit—chances are that someone will soon be looking for them. While it is possible for SEALs to dive to a submerged boat and be recovered, the threat still exists; the boat remains vulnerable. Not to mention what would happen if they were bringing someone back with them who was unable, or unwilling, to make the descent.

The Minisub Answer

It is important to note, however, that while these methods have proven themselves capable over time, one certain improvement has met with opposition. This is the use of dry minisubs. The leading

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[9] John Dwyer, *SEALs in Desert Storm*, United States Naval Institute Proceedings, July 1992, p. 95.

contender seems to the be 3gst9 built in Italy. Costing a mere $14 million each, the 3gst9 can hold as many as nine SEALs and crew. Its range is advertised at 400 miles subsurface and it is capable of reaching depths of over 2,000 feet.[10] So what makes this small craft able to operate at these parameters? Instead of using cumbersome oxygen tanks that must be stored internally, the hull actually makes up the gas storage system, both for the oxygen, and the exhaust. As the oxygen is used up by the motor, it is replaced by the waste gasses produced. The result? No bubbles. For propulsion, it makes use of a fuel efficient, compact, closed-cycle diesel engine housed in a heavily insulated compartment that allows the craft to motor along in near-silence that makes the craft silent.

So what does the future hold for this craft? The United States Navy reviewed the 3gst9 in 1988 and gave it favorable marks. So promising was the concept, in fact, that Congress approved $15 million for further studies. Since the money for buying an ASDS (Advanced Swimmer Delivery System) was to come from the fenced Special Operations Forces budget, the Navy did not have a budgetary voice. The Italian craft was finally judged to be inappropriate, but the need nevertheless still exists.

Such a craft would eliminate diver fatigue brought on by extensive underwater time in free-flooding SDVs. The SEAL operatives could remain warm and dry until the last possible moment and deposited in the location and depth of their choice. Additionally, this would eliminate the risk of placing a multi-billion dollar SSN in shallow coastal waters. It would also open up the cold-water regions to unrestricted access. Although the idea is seldom considered, asking a SEAL to swim even one or two miles in sub-freezing Arctic water is an invitation to disaster. Human performance studies have shown just how appreciably the human body reacts to such adverse conditions. When all these points are considered, it becomes clear just how badly the Navy needs the minisub.

An Example

The minisub had certainly come a long way in the past 48 hours. First, ferried by C-141 from Italy to Saudi Arabia, then

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[10] Marcinko and Weismann, p. 54.

off-loaded onto a trailer and placed by crane into the waiting cargo bay of the secretly converted merchantman SS WALTER JOHNSON. Then came the unchallenged journey up the Persian Gulf to the staging point 20 miles off the coast of Iran. Next, the merchantman slowed—to stop would be to invite unwanted attention. The hidden outer door was opened, and the cargo bay allowed to partially flood. The ASDS was on its way.

That was two hours ago. Right now, the sonarman aboard the minisub is busy monitoring the enemy frigate as it passed overhead. As expected, the ship continued on its way, unaware that it had just passed over the very threat it was looking for. Running silently on its diesel motor and encapsulated by a hull constructed of non-ferrous metals, no enemy had ever looked twice when the minisub was around. The veteran skipper of the boat looked at his copilot/sonarman, then back at the four passengers. He would never feel entirely comfortable with the SEALs, even though he had operated with them many times before. Why anyone would choose to swim around in the dark and cold was beyond him. Turning back to his duties, he noted on his virtual image screen that the steel net draped across the entrance to the harbor was rapidly approaching. Now it would get interesting. "Ensign, we'll reach the barrier in two minutes; recommend you prepare for lockout." The officer in charge of the small SEAL team replied with a curt "affirmative", at which two of his group stood up and headed into the small diving chamber. Within minutes two of his team had deployed and made a hole in the net large enough for the sub to sneak through. They left behind a small beacon so they could more easily find their exit on their return. Once inside the harbor, the periscope was poked up at regular intervals and photographs were taken of the harbor, its ships, and its defenses. Another twenty minutes, and they had reached their objective. The entire SEAL team deployed this time, all of them leaving through the wet/dry airlock. As this would take some time, the skipper bottomed his boat and waited for their return.

The next day, spirits were high at the State Department. The Iranian ambassador had delivered the message that, after further consideration, American ships would once again be allowed to travel freely in the Gulf. Privately, he politely inquired as to whether or not any light could be shed on the recent disabling of the six largest missile boats in his inventory. Apparently, their propellers and shafts have been destroyed during the night and

would be out of action for four to six months...

Conclusion

While the concept of fighting in or from the littorals has only recently become the focus of everyone's attention, the SSN has been practicing long and hard for just this day. As a matter of fact "in the past 20 years the attack submarine force has amassed more than 14,000 submarine days conducting submerged, real-world contingency operations and training exercises in water less that 600 feet deep".[11] This experience should be applied to the formation of a special unit training in the operation of small dry submersibles. Such a craft would provide an almost undetectable, and certainly unexpected, asset that could operate with impunity off the shore of the most heavily defended coastlines in the world. All this, without having to place at risk a billion dollar nuclear submarine and its crew. Less detectability, less risk, less cost, equal results. In this time of budget consciousness, the minisub seems to be the right answer at the right time.

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[11] P. Kevin Peppe, *Submarines in the Littorals*, United States Naval Institute Proceedings, July 1993, p. 48.

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The United States Submarine Veterans will be holding their 1994 national convention in Portsmouth, NH August 17 through August 21. For more information about the events scheduled, contact:

Bob Matthews
U.S. Submarine Veterans
1994 Convention Chairman
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(207) 748-1002

AN EXPERIMENTAL ROCKET FIRING ASW SUBMARINE

by William P. Gruner

The Thousand-Year Peace is not yet here. As we await its coming the wealthier nations prepare for war. No one knows how or when the ex-Soviet Union, Iran and other nations plan to employ the submarines they are acquiring. These are not leftovers from the 1940s. They are modern long range submarines equipped with advanced propulsion, electronics and weapons. It behooves the United States to proceed with the development of a true submersible capable of combatting these foreign submarines from beneath the surface.

SSN-X4 Principal Features

SSN-X4 is a hypothetical nuclear powered submarine of moderate size—about 1,200 tons. Her primary target is an enemy deep diving submarine. Her design incorporates a number of major features provided by advanced technology. These give her the ability to close targets while fully submerged, and attack with rockets from beneath them. Principal features are:

- An electro-optical system equipped with optical sensors to allow the attack party to observe and attack targets from the depths.
- Two batteries of solid propellant underwater rockets capable of blowing holes in the bottoms of submarines and surface ships
- Computerized automated tracking, maneuver and optical fire-control systems to give her the ability to safely approach and attack while fully submerged
- The internal arrangement shown in Figure 1 places the control room in the bow. As shown in Figure 2, the proximity of all members of the attack party permits easy viewing of underwater imagery on large screen displays, other tactical displays, and improved inter-communications.
- A very accurate inertial navigation system
- Modern sonar equipment for long range target detection and classification, and blue-green laser equipment for aero/space communications.

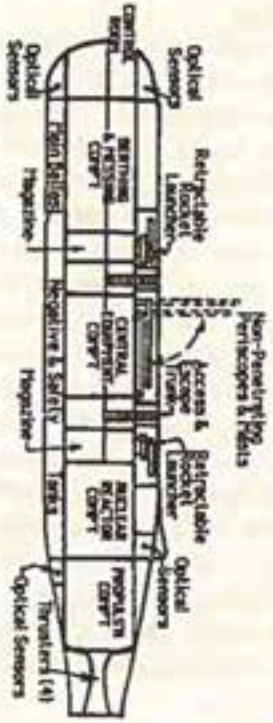

Figure 1. Internal Arrangements

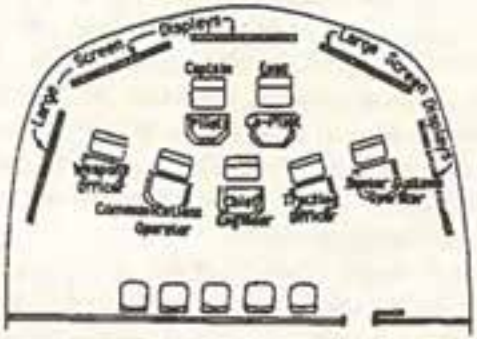

Figure 2. Battle Station Positions

Attack from the Depths

The experimental SSN-X4 completed scheduled engineering tests in August 1999 and then began system tests to demonstrate her effectiveness as an ultra modern, anti-submarine submarine.

Surface Ship Attack. Upon completion of high speed and deep submergence runs, SSN-X4's Commanding Officer sets course for the test area south of San Clemente Island. The target group was already on station. It was composed of an unmanned target (an old destroyer taken out of the back channel), an escorting destroyer, and a cruiser. The target was rigged for remote radio control of speed and steering by the escorting destroyer. The cruiser provided accommodations for upward of 50 observers from both shore and sea commands. Shortly before noon the OOD of the submarine raised the non-penetrating electro-optical periscope for a sweep around the horizon and detected the tops of the target group about eight miles to the east-southeast. The CO ordered "battle stations, rocket", and instructed his Exec to set up the target group on the tracking system console. As prescribed in the test plan, the Exec set target group speed as 15 knots and course 270°. He also entered the estimated range to the target as 16,000 yards.

Initial Approach Phase. The target led the group. Her controlling escort was a mile astern on her starboard quarter and the cruiser a mile north of her on her starboard beam. SSN-X4's tracking system maintained an independent track of each ship. As soon as the Exec announced that the problem had been set up, the CO cut in the track display on his own console. He advanced the ship movements in time and determined that at 15 knots he would cross ahead of the cruiser in about 15 minutes. He then selected a point ahead of the cruiser and about a mile north of her projected track as the terminal point for the initial phase of the approach. Readjusting the display to real-time to display the current situation, he specified depth 300 feet, speed 15 knots, and turned the problem over to the automatic control system' for execution of a completely submerged approach.

Track displays on the consoles of the CO, Exec, Tracking and Weapons Officers showed miniature profiles of SSN-X4 and ships of the target group, together with their generated tracks, bearing lines and distances from the submarine to the ships of the target group. This displayed data allowed the attack party to easily follow the approach as it developed. Some minutes later sonar

detected the escort destroyer's echo ranging, and sonar bearings permitted a minor adjustment to be made to the target setup.

The Attack. The automatic control system completed the run to the initial terminal point as specified. At that time the CO reduced speed to five knots. Shortly thereafter, sonar bearings confirmed that the submarine had passed ahead of the cruiser at a generated distance of about 6,000 yards. Six minutes later a blurred image of the target's underwater hull was picked up by the port side optical sensor at a range of 3,200 yards. Optical bearings were then fed into the tracking system. Image sharpness increased as the target drew nearer, and a range of 1,500 yards was obtained with the blue-green laser range finder. The optical system was then put into the automatic tracking mode to allow target azimuth and elevation angles to be directly entered into the fire control system to generate data for aiming the rocket battery.

The Captain directed the Weapons Officer to arm four rockets of the after battery, and to fire *on automatic* when the submarine arrived at a pre-planned position directly beneath the target. The automatic control system maintained the submarine's attitude, course and depth precisely as the moment for rocket launching neared. A slight jar was felt when the rockets fired. The Weapons Officer reported, "four rockets launched", and the Captain ordered "ahead full" to clear the area beneath the damaged ship. View of the target was temporarily obscured by rocket exhaust gasses. However, the roar of the rockets' exhaust as they sped to the target could be clearly heard throughout the submarine, as well as from sonar speakers. Within two seconds the warhead charges were heard to explode as they hit the hull.

Observers on the cruiser and escort destroyer saw the forward half of the target fold back against the stern in a hairpin like bend. Then the bow rolled onto its sides and both halves sank. The submarine attack party also witnessed the hulk sink into the depths on their large screen displays.

Anti-Submarine Attack. An aged diesel submarine had been selected as target for this attack. The target was trimmed for near neutral buoyancy and suspended from large buoys at bow and stern. This allowed it to drift with the current at a depth of 200 feet. Antennas on the buoys provided a means for radio control of a high pressure air bank within the hull so that ballast tanks could be blown if necessary to resurface the submarine.

A P-3 ASW aircraft equipped to communicate with the

submerged submarine by blue-green laser link initiated the exercise by transmitting an "Execute". The sky was clear and the sun was high. Starting at a range of 6,000 yards from the buoys, SSN-X4 approached the target from its beam at speed 10 knots, depth 300 feet. Speed was reduced to five knots and depth increased to 450 feet when the electro-optical system detected the target at a range of 3,000 yards. The attack was conducted in a manner similar to that made on the surface ship, except that only three rockets were launched when beneath the target. The implosion caused by high pressure sea water rushing into the fractured hull caused it to break into a few large pieces which quickly sank.

Underwater Rockets

Underwater rockets are not new. During World War II the Germans began development of a submarine launched underwater rocket with the code named URSEL. It was designed as a U-boat weapon of last resort. Four rockets mounted on rail launchers were affixed to a trainable base located in the U-boat's superstructure. The rockets could be launched at depths up to at least 50 meters (164 feet), and possibly up to 100 meters (328 feet). Rocket speed was 60 meters (190 feet) per second, enabling one to hit its target a second or two after launch. The proposed tactic was to fire the rockets simultaneously as the attacker approached within range. The rockets were ignited electrically from inside the U-boat when a tilted topside hydrophone indicated a favorable angle for firing. Rockets that missed the target were designed to self destruct after broaching the surface. Rockets launched from a depth of 50 meters showed approximately 50 percent hits on a square four by four meter target. Samples of URSEL and a smaller underwater rocket were taken from German development sites for further examination after the war.

In the United States in the early 1950s, a group led by the noted hydrodynamicist Calvin Gongwer of Aerojet Azusa conducted limited tests of underwater rockets. As I recall, 5" HVARs were fitted with fins to provide spin stabilization. Rockets launched in a horizontal trajectory from a platform at a target off San Clemente Island showed good accuracy and considerable promise. However, the project was soon cancelled.

Underwater Vision

All animals, including human beings, are able to *see* when light energy from all, or portions of, the electromagnetic specturm impacts on light sensitive receptors in the eye. In this discussion, vision refers to that portion of the spectrum extending from infra-red to ultra-violet. This is not to say that radiation from other portions of the spectrum cannot be observed. Although light energy suffers very little attenuation in air and space, attenuation increases greatly when it travels through sea water. Thus, the unaided ability of the human eye to see in that medium is quite limited.

Except for Jacques Cousteau, Auguste and Jacques Piccard, Robert S. Dietz, Nils Jerlov, a few other scientists, plus scuba divers, and salvage experts, there has been little interest in seeing far beneath the surface of the sea. Most submariners probably consider the range of vision too limited to be tactically useful because they are unaware of the great advances that have been made in electro-optic technology which now greatly extends the range of underwater vision.

Some Facts About Underwater Vision Capability. Four major factors determine our ability to see objects through sea water. The first is the amount of light emanating from the body we want to see. The second is the ability of light to penetrate the water separating us from that object. The third is our ability to capture and utilize the light emanating from the object, and the fourth is the clarity of the water.

Objects are visible when light is emitted by, or reflected from them. In general, underwater hulls of ships will be seen when light from the sky is reflected from their hulls. Sunlight on the water is the major source of this light. The sun is also the source of light reflected from the moon and stars, and indirectly the source of chemical and biological light produced by animal and plant life in the sea.

Major factors determining the degree to which objects are illuminated by light from the sky include the position of the earth in its orbit about the sun (season of the year); the altitude of the sun or moon; the latitude of the object to be viewed; and the degree of cloud cover, haze, fog and overcast. Aside from light reflected from a ship's hull, the glow of bioluminescence resulting from the passage of ships can sometimes be seen. In both cases we are concerned with the penetrability of this light through ocean water to a light collector.

Approximately 60 percent of the attenuation of light energy as it travels through sea water is due to scattering and 40 percent to absorption. Water has only one important frequency window in which attenuation is minimum. It lies in a narrow band of blue-green light near 480 mu (0.480 microns or millionths of a meter). At what depth can the unaided human eye detect light? It appears from the observations of William Beebe in the 1930s and Jacques Piccard in the '50s and '60s that on a bright sunny day in clear water, light grows dim at about 500 feet. (See references 2 and 3.) Figure 3 is a copy of a photograph of a school of tuna taken under natural light conditions at a depth of 200 meters (656 feet) during the Gulf Stream drift-cruise of the mesoscaphe *Ben Franklin*.[3] Light fades to a faint hint of death gray at about 1,500 feet, and total darkness sets in at about 2,400 feet. In the open ocean, water clarity does not seem to be a serious problem. The above observations have been made through portholes in underwater vehicles, and do not reflect what can be accomplished by using light amplifiers, large light collectors, and computer aided image enhancement.

The Sub-Surface Attack System Design

Underwater Rocket Weapon System. The primary target is an enemy deep diving submarine. Rocket range should be about 1,000 feet, and the payload must consist of a conventional shaped charge with adequate power to fracture the hull of such a submarine upon contact. The rocket battery should be capable of launching at least four rockets singly, and in salvo. The launcher must be controllable in train and elevation, and retractable within the envelope of the streamlined hull or superstructure. Launcher reload capability is highly desirable.

The Electro-Optical System. In view of the severe attenuation of light in sea water, an electro-optical system must be employed to replace the human Mark I eyeball. Without trying to design the electro-optical system in detail, it must function in the blue-green portion of the spectrum and should generally consist of one or more of each of the following: a controllable large aperture light collector (camera); a light sensitive element to convert light energy to electrical signals; fiber-optic cabling for the transmission of electrical signals; a light amplifier (photomultiplier); and a receiver with imagery display capability. The system should

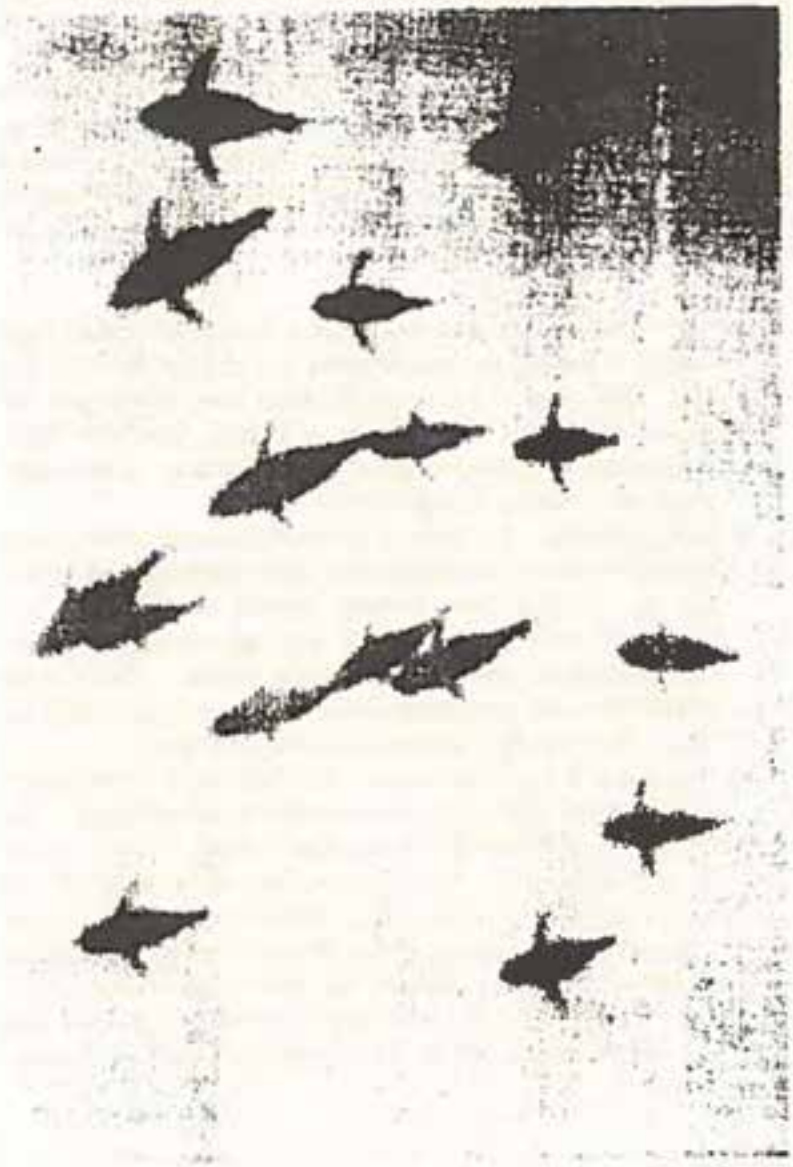

Figure 3. "A Shoal of Tuna at a Depth of 200 Meters (photographed by natural light[3])
(Photograph by Jacques Piccard, from *The Sun Beneath the Sea*, c. 1971, Jacques Piccard, Macmillan Publishing Company, New York.)

employ computer techniques for *camera* motion control, stabilization of line-of-sight, angular measurements, light and focus control, multi-color display and image enhancement.

Relatively simple cameras are used in underwater photography and remote underwater television. Similarly, light amplifiers, filters, fiber optic cables, and computer controlled color displays are available. These represent the basic technology that must be employed in developing equipment for our special application. Considerations for design are:

- Light Collection. The ability of a camera to collect light energy is largely dependent upon the area of the collector lens. The area of a 10 inch diameter lens can collect 100 times more light energy than a 1 inch diameter lends. Periscopes are generally poor light collectors. Our underwater *cameras* need large collector lenses.
- Image Display. A computer controlled color display should be employed to allow the user to select the best presentation for the intended use. Imagery should be displayed in a manner to show the angular direction and movement of the line-of-sight in orthagonal reference planes. The display should allow the operator to make angular measurements for target tracking, fire control and other purposes.
- Fire Control Considerations. The very short wave length of blue-green light can provide accurate bearing data. The system should provide for automatic target tracking based on optical bearings. A blue-green laser range finder should be provided for precise range measurements. A simple lead-sight type of aiming device should be adequate because of the short time of flight of the underwater rocket (about 1 to 3 seconds), the expected slow speed of ship and submarine targets (20 to 50 feet/second), and their great inertia.

<u>Conclusions</u>

- Potentially hostile nations are acquiring modern long range submarines.
- Technology exists to support development of an experimental submersible equipped with the advanced electro-optical/rocket attack system described above.
- Our Navy should immediately begin this development in

order to improve U.S. ASW capability. Secondary development objectives are training of personnel in the maintenance and usage of these new types of equipment, and the development of tactics.

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A BRIEF ON USS PERCH (SS 176) (P-5)

by CWO4 Sam Simpson, USN(Ret.)

Having given all before me a chance to pay tribute to the gallant submarine PERCH (SS 176), formerly P-5, constructed at the EB Company in Groton, CT, I hereby give my views on that great hunk of steel and of my shipmates that gave their all to keep her afloat.

Pig boats they call them, but that name never applied to PERCH. She was the thriving home and pride of some 55 men.

She was long and sleek and beautiful with a bone in her mouth and as fancy as they come with her plume in full stream. She took her place in the nest second to none.

She steamed in the Atlantic, the Pacific and the Indian Oceans. From the Caribbean Sea to the Bering Sea. From the Yellow Sea to the Java Sea. No doubt she passed the cracks in the ocean that Leviathan calleth his home many times.

Silent and seaworthy, she was a mighty fortress. Yet Portuguese man-of-wars sailed from her prow and flying fish flopped on her decks. When the seas were blue with a white fringe on top, a grateful crew sunned themselves on her top side. Some sailed kites, releasing handkerchief parachutes to fall into the sea. At other times there were turtle hunts and picnics and a swim call in the Sulu Sea. Yes, she was a home away from home.

But there was another side to PERCH. After months at sea, she was gaunt, mossy, weathered by gales and typhoons. She prowled the seas looking for the enemy. She was the hunter on the trail of the hunted. The eyes of the front line, reporting the advance of the enemy; she was an artist at avoiding detection and cunning at deceiving the enemy.

A wisp of smoke, a glimpse of a mast behind a cloud, the silhouette of a possible target or the thud of a different propeller transformed her into something else—all eyes and ears to take her prey where she found it, making reports underway.

There were some disappointments and narrow escapes, like a circling torpedo, and a shell through the conning tower, scars from night raids on the enemy. Depth charge attacks were a common event in those days when the Rising Sun was still rising.

Though PERCH's hull was badly flattened and her hatches badly twisted, she leaked very little to the eye. She was strong.

Though her propeller shaft was bent and her engines loose from their moorings, she held tight.

The acrid smoke from torpedoes that had run in their skids didn't help. It was the chlorine gas and steady build-up of water in several bilges that was to seal her fate.

In the middle of the night, free from the bottom, she wallowed in the sea. No gauges, few lights. The getaway was slow.

Repairs having been completed, the predawn effort to submerge was made. The word came, "Take her down", but she wouldn't go! Like a giant dolphin she leaped and dove. Water poured under twisted hatch covers, which would not seat. After several attempts to dive and in the midst of enemy shell fire, the word was passed to abandon ship. As I passed through the control room, Charlie Cross, Chief of the Boat, on the manifold, said, "You had better hurry. She is settling in the water and could go at any time."

I sat on the deck aft, taking off my shoes—she slipped from under me and I floated off the deck into the sea and night.

Midst a background of red and yellow gunburst, she made a grand entry into the Java Sea. Going down by the stern, raising her prow to an angle of about 35° she gave her last salute and silently slipped backwards into the sea.

In retrospect I recall several persons diving from the A frames into the sea just before she went down.

All hands got off OK and were later picked up by some of the Jap fleet that had been shelling us.

We were off-loaded several days later at Makassar, a city on the island of Celebes, Netherlands, Dutch East Indies. ■

THE SUBMARINE'S LONG SHADOW

by CDR Robert H. Smith, USN(Ret.)

[Reprinted with permission from U.S. Naval Institute Proceedings of March 1966—The 1966 USNI Prize Essay.]

The idea of the submarine perhaps entered the mind of man not long after he first looked at the sea. But, until the present century, the history of submarine warfare is only a succession of fascinating episodes, wrought by a handful of daring men venturing forth in strange contraptions more dangerous to themselves than to their adversaries. The modern submarine had to await the age of steel and the engine of Otto Diesel before it could be born. Then, on 22 September 1914, a U-boat sank three British cruisers in a single hour, and a new dimension was added to naval warfare. It is the intent of this essay to develop the thesis that the nuclear submarine is a challenge far more profound than was hurled at the navies of the world that September day in 1914. From examination of the essential nature of submarine warfare, the elements of this challenge and their meaning to the United States will be deduced.

It is necessary, at the outset, to establish the fundamental characteristic of the submarine. Elementary as it is, it must be isolated in order to provide a basis by which the import of the nuclear submarine can be grasped. What is it, then, that defines the submarine? It is not speed. There are ships that go faster. Nor is it weapons. The submarine possess none that cannot be carried in other hulls. Least of all is it defensive strength. The submarine is a heavyweight, but it has a glass jaw. The unique attribute of the submarine, from which all its other virtues flow, is simply its ability to hide in the sea.

To appreciate the value of this single fact, consider the submarine's *modus operandi* in World War II. The submarine of that war was in reality a surface ship. It spent the majority of its time on the surface, transited on the surface and, whenever it could, attacked on the surface. Its submerged capability was a hoarded asset, reserved for vital encounters, to achieve success in attack or to make escape possible. Yet, limited as this capability was, with submerged speeds slow and their duration rigidly bound by curves of battery exhaustion, the German U-boat, exploiting the precious advantage conferred, was almost able to cut the Allied

sea lanes. It follows, as a corollary—and a paradoxical one—that the story of the U-boat's defeat was the creation by the Allies of an ocean environment where the submarine could not operate sufficiently exposed above the surface. A vast search and surveillance effort relentlessly stripped away the freedom and mobility of surface operations essential to its success. Increasingly it was *forced* to hide, relying more and more heavily upon the resource of submergence, and in the crucial North Atlantic areas its offensive capability was reduced to the vanishing point. In the Pacific, on the other hand, where the conditions responsible for the submarine's defeat did not prevail, the American submarine campaign achieved a strangulating blockade. The success of this campaign, incidentally, provides a useful corrective to the notion that the submarine always loses.

Despite victory in the Atlantic, the advent of the snorkel and the medium-speed, deep-diving submarine—typified by the German Type-XXI boat, which came too late on the scene to affect the course of the war—raised serious new ASW problems for which no solutions were imminent. Accordingly, soon after the war ended, ASW was designated the number one item of urgency in the U.S. Navy. And ever since, for two decades, it has had a priority, which, though occasionally dethroned, in theory has never strayed very far from pre-eminence.

Looking back to the decade of ASW research and development that spanned the last half of the 1940s to the mid-1950s, those years have the nostalgic aura of a simpler age. Then, Key West was the hub of ASW to a greater extent than it is today. And down there at the end of the line, in an atmosphere having a special and remote foreign flavor, surface sailors, aviators, and submariners, worked and socialized together in a close communion of blended knowledge and related goals. It was a time in ASW, as no other seems to have been quite so much since, of excitement and hope—especially hope, strong, rational, contagious. It seemed that with the application of enough enthusiasm, energy, and thought that the solution to the submarine was almost in our grasp. There was a communicable feeling that we were getting somewhere. *And we were.*

In retrospect, it is easier to see now that the medium-speed, deep-diving submarine, realistically assessed, was less of a threat than it originally seemed. Though its submerged speed had doubled, its submerged capability was still a finite, precious asset

which had to be used sparingly. And the snorkel, though more difficult to detect, was nevertheless something that thrust above the surface. The submarine remained an air-breather, its fundamental nature unaltered.

If the capabilities of ASW forces versus the submarine were to be plotted graphically, across a scale of years, for the decade which succeeded the end of World War II, we would see a steady upward movement. The reasons are many and tangible. The decade witnessed, in the development of major improvements in sensors, weaponry, and tactics, a virtually unbroken advance on many fronts of ASW. A symbolic high point of the U.S. Navy's rising capability came during a major exercise in 1954 which for the first time brought together in the Fleet many of those new developments. At the exercise critique, more than one speaker was tempted to offer the view that the submarine was very much on the run. To such remarks the submarine commander replied generously, praising the performance of the ASW forces. But he added a few words of caution, concluding with some lines from Alice in Wonderland.

Tis the voice of the lobster...
When the sands are all dry, he is gay as a lark.
And will talk in contemptuous tones of the Shark;
But, when the tide rises and sharks are around,
His voice has a timid and tremulous sound.

The euphoria prevailing in some ASW circles was fleeting. In January 1955, the USS NAUTILUS (SSN-571) was underway on nuclear power and that same year the battery-powered USS ALBACORE (AGSS-569), whose shape, classic fineness ratio, and quietness were equally expressive of things to come, also demonstrated her capabilities. But the twin facts of the ALBACORE and NAUTILUS, disruptive as they were to any thought about the permanency of the submarine's subjection, were, after all, only the shadow, and not the substance, of the future. For those who wished to find them, there were consolations. For all the potential of the NAUTILUS, there was only one of her. And, as was soon learned, she was a noisy beast. And who could say what ASW advances the years might not bring? There was much talk about the possibility of a breakthrough, and the word, through repetition, began to assume the shape of probability. Anyway, some time

remained to do something about the submarine.

Perhaps there still is time. But it is less now, less by ten years. Where do we stand?

If conflict should commence today of a nature requiring the Western Allies to keep their sea lanes open, it is probable that the threat could be contained. This prediction is based on the twin assumptions that the strength of the potential enemy submarine forces is preponderantly in conventional submarines of a capability roughly comparable to our own and that the intrinsic ability of our own ASW forces relative to those of the conventional submarine remains strong. There is a strong cautionary footnote, however, to this prediction. It relates to the magnitude of our ASW forces, the sheer numbers of airplanes, ships, escorts, and hunter-killer groups initially available. In assessing our ability to meet the first shock of an all-out submarine campaign, the existence of the Soviet's 400 submarines, the largest force ever assembled in peacetime, must be weighed against the handful of U-boats Germany was able to put on the line at the beginnings of two World Wars.

When the strategist turns from the conventional to the nuclear submarine—and toward that nearing future when navies will face the reality of opposing fleets of advanced nuclear submarines—he moves from a difficult, but finite, problem to one whose very dimensions appear unbounded. For, by the creation of the NAUTILUS, the gains of many years of ASW progress were erased. Since then, with the nuclear power plant married to the ALBACORE configuration, the submarine has opened a yawning gap between its own capabilities and those of the ASW forces. Taking departure once more from the fact that the basic virtue of the submarine is its ability to remain hidden, we see in nuclear power an almost finite multiplication of this capability. When additional assets of high submerged speed (and virtually limitless endurance at that speed), coupled with the incorporation of the most advanced sensors and weapons of modern technology, are conferred as well, it is manifest that we are witness to something new in naval warships. It is not merely an improved submarine. It is a change of degree so formidable as to constitute a change in kind.

It is only in seeking to discern the shape of a future struggle against such a submarine, however, that we gain full measure of its impact. To begin with, the nuclear submarine virtually

nullifies the effectiveness of both the vehicle and the sensor—airplane and radar—that more than any other were responsible for its defeat in World War II. The airplane, deprived of opportunities, will find itself roaming over the surface of an empty ocean, barren of clues, its value narrowing to whatever roles its capabilities will permit in localization and tracking.

And it is the absence of clues as to the submarine's general location that would be one of the distinguishing characteristics of war against the nuclear submarine, and a measure of its increase in difficulty. For it was these clues in World War II, and the uses they served, that were fundamental in defeating the U-boat. These were the clues that made evasive convoy routing effective, led hunter-killer groups in toward their kills, and provided the continuing base of information that enabled offensive ASW forces to achieve suppression and harassment of the submarine from portal to portal. Victory in World War II was a mosaic pattern composed of millions of fragments of incident and encounter, most of them minor in themselves, but together mounting to a high cumulative probability against the submarine's being able to accomplish its mission. It is a pattern that will not exist for the nuclear submarine. Even should it choose to repeat the U-boat error of indiscriminate use of radio, it is difficult to see the value of an HF/DF datum that it can render ice-cold by hundreds of miles in a matter of a few hours.

It is extremely unlikely that the nuclear submarine will be defeated at a distance. It follows, then, that the locus of decision will contract to the vicinity of its objective area, whatever it might be, ship, convoy, or naval task group. There, at last, it is subject to detection and attack. Such engagements will be sudden, fast-developing, confusing, with the submarine able to attack, withdraw, regroup (if operating in concert), and attack again with the freedom of direction and timing which its superb mobility encourages. Thus, it becomes apparent that the responsibility of protection, and perhaps the primary burden of defeating the nuclear submarine itself, will devolve upon the immediate defensive forces. And upon none so much as the escort. Upon it will be thrust the problem of detecting the submarine at long range, swiftly classifying it, and sending a weapon on its way. The imperatives of the problem, systems of both detection and attack that can achieve probabilities of success, coupled with a skill and responsiveness that must be continually available on

instant notice, are, in aggregate, demands which the best of present escorts, even under optimum conditions, can seldom meet.

That that defensive effort alone, however, no matter how vigorously applied, can defeat the nuclear submarine appears improbable. Apart from the unsolved specifics of the problem, it contradicts the history of warfare, which records few instances of defense alone bringing victory. Looking then to those possible means of carrying the war offensively to the nuclear submarine, and excepting (while not dismissing) such efforts as mining and the bombing of bases and factories which support the submarine, the only reasonable possibility of seeking out and destroying the nuclear submarine at sea appears to exist in another nuclear submarine. Here, as well, detection is the core of the problem. For its efforts to be productive, it must be able to station itself where the probability of detection is high. Once detection is achieved, the outcome of such encounters is problematical. For wariness on the part of the detected nuclear submarine must be assumed. It may choose suddenly, at random, to slow and listen, and the original detector, moving to attack position, may itself unknowingly be detected, the stalker becoming the stalked. In this contest, like two cats in the darkness, success will go to him who possesses not necessarily superiority in sensors and weapons only, but also the finer edge of nerve and hunch.

Though recognizing that the restraints which may exist in any future conflict at sea are hypothetical, the subject of nuclear ASW weapons must be discussed. At first glance, they may appear to be a panacea, promising the certainty of a kill from virtually any encounter. A second glance brings second thoughts, however. To begin with, the problem of detection still remains. But, more fundamental, these weapons cut two ways. Unilateral possession by the ASW forces cannot be assumed; there are no reasons why the submarine cannot possess effective tactical nuclear weapons. And considering the nature of submarine warfare, which almost always grants prior detection and tracking of surface forces at ranges much greater than that at which its own detection is likely to occur, an advantage accrues to the submarine which is as old as human conflict—that of striking the first blow. And when the weapon is nuclear, patently the first blow is likely to be the decisive one.

Finally, assessment of the nuclear submarine in war would be incomplete without brief consideration of the ultimate prob-

lem—both in terms of the magnitude of the threat and the difficulty of countering it—which is its ability to place itself, undetected, within delivery range of ballistic missiles to continental targets and to launch them. A capability almost impossible to deny even in the conventional submarine, in the nuclear submarine it is absolute. Embedded in the overwhelming logic that justifies our own Polaris submarines, are the same reasons why it can be done to the United States.

At this point the reader, while perhaps willing to concede the general truth of the situation as thus far outlined, may nevertheless object that the statement of the problem is amiss. It may seem that in the conflict hypothesized a *future* force of nuclear submarines has been pitted against *present* ASW forces, an unfair stacking of the cards. But the point is that submarines of the capabilities discussed are *not* hypothetical. Though their numbers are still small, they are real, in commission—*on the hoof*! And to defeat them, neither in the most advanced ASW abilities of the present, nor, as will now be considered in current research and development, can there be seen other than slim promise of attaining the capabilities needed.

The message is written in large, clear letters. To the power that would seek to overturn the historic maritime supremacy of the West, the nuclear submarine is an incomparable opportunity, waiting to be seized.

Looking to the future, and the potential of research and development to provide the means to defeat the nuclear submarine, there is no need to dwell upon the problem of killing it. Though some shadows remain, if any prediction can safely be made concerning the nuclear submarine, weaponry appears to be one area where we are not lagging the problem. Both surface ship and attack submarine are being provided with weapons and delivery systems commensurate with, and usually exceeding, their detection capabilities.

In World War I, the primary sensor was the human eye. In World War II, radar. For the nuclear submarine, freed of the necessity to expose itself, detection narrows to dependence on sound. If this generalization appears to have excluded many possible detection methods from serious consideration, it is not inadvertent. The naval planner is obliged to proceed on the basis of realities, or what reasonably can be forecast, and only sound meets this standard. The other methods are simply areas of

investigation, gossamers of hope, nothing more. In assessing what is realistic promise, one must be guided by the record of a quarter of a century of research into innumerable varied and exotic methods of detecting a submerged submarine, their results alike proving insubstantial, and retreat to the prudent conclusion that we stand or fall by sound.

What, then, can be done with sound? First, we can listen, and, if the submarine radiates noise, we may hear it. But the quiet nuclear submarine gives little to work with. In ships, in fixed systems, in sonobuoys, whatever the listening device, we are faced with the virtually insuperable handicap of often trying to detect sounds scarcely above the level of the sounds of the sea itself. And the ranges at which these sounds can be heard are seldom usefully long unless the submarine is going fast, and not always then. But, above all, the passive mode is fundamentally flawed because its success depends upon the co-operation—the very uncertain co-operation—of the submarine itself to provide sound that can be heard. With the exception of the killer submarine, whose quiet platform and tactics logically incline it towards the passive mode, it is upon active sound that we must depend primarily.

Since the end of World War II, progress in surface ship sonars has been achieved essentially by successive lowerings of frequency and increases in transducer size and power. By the measure of 20 years of effort, the advance has been modest. It has been an engineering gain rather than the product of discovery, and the primary sonar in the U.S. Navy today is a derivative, a very recognizable grandchild, of the original scanning sonar. The basic limitations of direct path transmission still prevail, and while detection ranges of periscope-depth submarines have been increased many-fold, the improvement for deep, below-layer submarines is small. Even such gains as have been achieved are not unmixed successes. Close-in detection and tracking capability has diminished and the problem of classification, that perennial stepchild of detection, is farther from solution than it was a decade ago. In the steps necessary to achieve longer ranges, we have deprived the sonar operator of doppler and other clues, taken from him the arts of classification, without providing him with the tools to compensate for their loss. Variable Depth Sonar (VDS), long the object of many high hopes, has come down from those high hopes and found a more realistic niche for itself in filling some of

the gaps in the capability of the hull-mounted sonar.

From improved signal processing, and other techniques, we attempt to extract all possible information from the returning sound. It is of the sum of all such efforts to improve our sonars, that we refer—having at last abandoned that talisman, the "breakthrough"—to the goal of "successive increments" eventually bringing us up to the needed capability. But the ocean yields grudgingly, the increments grow finer, half by half again, suggesting that over our efforts hovers one of those infinite series of diminishing terms whose limit is a finite number.

In a bold attempt to overleap the limitations of current surface ship sonars, urgent effort is being directed toward perfection of a sonar which can exploit the experimentally demonstrable techniques of very long-range sound transmission by bottom bounce and convergence zones. When the day comes that this sonar is capable—under realistic, operational conditions, over a substantial portion of the world's oceans—of reaching out and detecting, classifying, and tracking at the ranges theoretically possible for it, the escort will have taken a long step toward that desperately needed parity with the nuclear submarine. While areas of uncertainty are many, to this massive effort can at least be fairly attached the much-abused label, "promising."

When we look to that ultimate problem of the ballistic missile submarine, and the extent to which sound can assist in solving it, we are speaking of a degree of difficulty beside which placing a man on the moon is a neat exercise. And yet, conceivably, the solution to the problem could exist in the placement of acoustic arrays—*active* arrays—backed up by the necessary destructive and monitoring forces far from the shores of the United States. It is an idea which the capabilities of present technology at least do not render totally impossible, especially when coupled with the constricted geography of the northern passages of the Atlantic that is the fascination of naval strategists. But to create such a system, were it concluded that national interest demanded it, would require a mobilization of resources and treasure involving ramifications no less complex than, and complementary to, those which surround the issues of the systems needed to defend against the ICBMs. However, even were such a system feasible, it would seem foredoomed to obsolescence even in its construction. When we contemplate the vastness of the oceans, the Pacific, which has no such enticing geography as the Atlantic, and the further increases

in range of which submarine-launched missiles are capable, the problem eventually expands to one of locating and destroying submarines anywhere on the globe, and credibility is demolished that it can be done at all.

At the present time it is impossible to estimate the ultimate capability of sound as a means of detection. Lack of knowledge circumscribes the limits of prediction. Even after many years we do not understand what happens to sound in the sea, and are uncertain of such basic acoustic quantities as target strength. Symptomatically, no scientist or engineer really trusts the other fellow's data and, after circling it warily, goes out to gather his own. Findings are seldom reproducible; one of the hardest things to glean from the sea is a fact. And where facts are few, theories abound. The ocean, vast, changing, presents a chaos of randomness and whimsical variability which thus far has humbled theories and defied attempts to reduce its nature to tidy limits of predictability. Whether greater knowledge of the ocean will enable us to achieve much more with sound remains problematical. But in any event, only increased knowledge will tell. In the end, perhaps, the best that can be done will be to define the effects of the sea in terms of its variances and to attempt to predict performance only within the range of limits.

Sooner or later, amidst concentration on problems the submarine presents, doubts are likely to take shape and loom in the background of one's thoughts. Doubts, for instance, that it is reasonable to expect that a surface ship, existing in the turbulent, interface of air and sea, inherently noisier and visually detectable, can ever attain a capability to match that of a submarine in which multiple virtues of invisibility, adaptation to a single environment of limited variability, and a concentrated focus of mission are harmoniously joined. And the doubts, all coalescing, add up to the fundamental question of whether, weighing the clear and demonstrable evidence of the submarine's great, and still growing, capabilities against the uncertain gains of ASW, we are not possibly witness to a historical trend which will culminate in the ascendancy of the submarine as the decisive arbiter of naval power.

It is a question, of course, that is unanswerable, except by time. But in a sense an answer, while not final, is being given and its general form can be read in the signs of today. The answer is that the response of the United States—because the

magnitude of the issues are not merely naval, but national—to the challenge, in effect, concedes the ultimate ascendence of the submarine.

The signs are many, large and small. There is one to be seen in our newest escorts whose maximum speed is below that of an advanced nuclear submarine. While these escorts may be adequate for the present, when considering a nominal (and always exceeded!) effective ship life of 20 years, it means that we are building a class of ships certain to be deficient in a capability needed to cope with a problem they must almost surely be prepared to face well before their lifetime ends. For though other qualities in a ship can be altered to keep current with the advance of the problem, such a fundamental one as speed cannot.

Some may argue that high speed is not vital in an escort, that only sensors and weapons are. But one ought first to observe a group of ASW ships maneuvering to hem in, and encircle, a submarine moving at a speed higher than the ships themselves are able to sustain before dismissing speed. It is a problem that ingenious tactics cannot surmount. Granted, speed is only *one*, and not the most important, asset an ASW ship must possess. But in a fight such as the nuclear submarine puts up, we cannot afford to deny the escort any assets.

Another sign of creeping surrender to the problem is seen in the token number of nuclear-powered surface ships being built. When one considers the great increase in safety conferred in defense against the submarine by the virtue of speed alone, and contemplates the favorable prospects of a nuclear-powered naval task force, able to steam indefinitely at this high speed, not bound to the inexorable restraints of fuel consumption nor having to subject itself every few days to the vulnerability inherent in the refueling operation, it is obvious that the implications of continued denial of nuclear power to the naval surface ship are grave not only in terms of effectiveness, but also of survival. In the long perspective, the arguments which prevail against a nuclear-powered surface navy are dismally shortsighted, an example of misapplied cost-effectiveness studies at their sterile worst.

The other side of the denial of nuclear power to the surface navy is the conferring of its benefits to our submarine force. It must be regarded as tacit affirmation of the belief that in the nuclear submarine lies the best hope of countering those of our potential enemies.

Another sign, and not the least, is money. The high priority that ASW has so long been supposed to enjoy is an illusion, mirroring good intentions more than deeds, hailed in theory rather than matched by funds. In reality, ASW in the U.S. Navy has long taken a back seat to other demands. Consistently ASW has had to make choices and compromises—and is still making them—involving the sacrifice of significant capabilities, in order to save sums of money that would be small expenditures in certain other programs.

In essence, then, reading the signs, the answer is given. Whether a conscious expression of policy, or merely the product of irresolution, the result is to bow to a trend whereby the advantages will flow ever more steadily in the direction of the submarine.

But to acknowledge the possibility of a historical trend at work is not to state that we have no option but to yield to it. To do so is to accord history rights of independent destiny, whereas history is shaped by the action of men. It is only in retrospect that trends can be said to have been irreversible. How the United States and the Navy meet the challenge of the nuclear submarine will depend upon our commitment to its solution in the light of the present, leaving to history the judgement of whether or not a solution was possible. There is much that can be done.

The first essential is comprehension of the problem. And though strong naval awareness exists, there are also circumstances operative which tend to limit, or at least to obscure, that clear understanding which must prevail at many levels before effective action can take place. One of these circumstances is in the process by which the Armed Services must wrest money for their programs from those who control it. Confess too frankly the difficulty of a problem, and funds are likely to not appear commensurate with cost. Overstate one's case, on the other hand, sell it too vigorously, and there is the risk of projected force levels being reduced since seemingly the job can be handled with less. It is a fine line to tread at best, and, in the case of a subject as complex and as full of unknowns as ASW, it is an impossible one.

Another factor is reluctance to concede too readily to any new weapon or system an authority it has not demonstrated in war. But this caution, defensible in other times, is a luxury we cannot afford. The compression of events, the swift pace of decision in any future conflict, makes it imperative that we perceive, and

accept, in the visible facts of existing nuclear submarines, the full extent of their portent.

And, as always, there is still some of the old virus of unjustified optimism around. Occasional exercise successes against the nuclear submarine are jubilantly reported as significant triumphs, instead of being viewed realistically in the context of the restricted conditions under which they were achieved. And for those who want to find comfort in the limitations of the nuclear submarine, there are still a few things on which to hang one's hat. It cannot do everything at once. If it goes too fast, it becomes blind. And excellent as its sound tracking may be, there still is that moment in attack when it craves the gratifying certainty of a good look that only exposure of its periscope can give.

A more difficult form of optimism to contend with is the kind that holds that the submarine, after its dramatic advances of recent years, has reached a comparative plateau in which future improvements will come more slowly, and hence that the pendulum must now swing back toward the ASW forces. The trouble with this notion is that it views progress as something fated, automatic, instead of deriving from endeavor and circumstances. The pendulum theory can be delusive; sometimes the pendulum gets stuck at one end of its travel and never does come back. And in speculating on the relative potential for growth of the submarine versus the ASW forces, the 95 percent of the ocean's volume of water which the submarine is not yet able to enter should discourage complacency as to any lack of logical direction to go.

There has been a recent sharp upturn of interest in ASW, accompanied by the creation of a central management authority. But successful direction of ASW can result only if vigor and momentum are maintained over many years. Anti-submarine warfare must build an organization for the long haul, seeing the problem in terms of decades, gathering in itself the people, the knowledge, and the experience—memories of past mistakes and hopes dashed—which are all essential for sound decisions. It must mean for many officers a change in the pattern of frequent career rotation, which is destructive to the continuity and professionalism so vitally needed in ASW. In recognition of the extent to which ASW cuts across the entire Navy, directive authority in ASW must be equal to the totality of the problem. Hulls and systems, from their very inception, must be brought forward with their missions and potential applications being continually reviewed. It makes

little sense to design a sonar capable of the most sensitive performance possible and then place it in a hull next to clanking steam machinery of a quarter of a century ago. The presently scattered and diffused programs of gathering acoustic and oceanographic data must be co-ordinated to provide a basis upon which realistic estimates of performance can be made *early* in the life of new systems.

Prophecy is one of man's most fallible endeavors, but perhaps some things can be foreseen. It appears that events will continue to move in the direction we read in the signs of the present. The nuclear submarine, growing in numbers and capabilities, will exert relentlessly increasing pressure on the future course of naval warfare. In ASW, where a choice must be made, the nuclear attack submarine will take priority as the system logically offering the best hope of defeating the submarine.

Thus, submarine warfare and anti-submarine warfare seem destined to be drawn together toward a common arena that will be the critical focus of decision.

No forecasts necessarily derive that the importance of the surface ship is soon to decline. The surface ship will endure because it does many vital jobs that must be done, and that the submarine cannot do. But if there should again be a war between great naval powers, it seems probable that the question of whose merchantman, whose naval task forces, it is that sail the oceans and do their jobs, will be settled primarily beneath the surface.

Out of long frustration with the problem, occasionally irritation creeps into naval attitudes toward the submarine. If only it did not enjoy the protective cloak of the sea, one sometimes hears it said, the submarine would not be so very much.

Precisely. But that is exactly what the submarine is all about. ■

The Trident Society will host a Submarine Birthday Ball on 8 July 1994 at the Auburn University Hotel and Conference Center in Auburn, AL. Interested parties should respond no later than 1 June 1994. Please contact:

OC Jason Terry (205) 742-0568
or
LT Stan Okon (205) 844-3432

TWENTY-EIGHT YEARS LATER

by CAPT Robert H. Smith, USN(Ret.)

[Ed. Note: Captain Smith graduated from the Naval Academy with the Class of 1947. His father was a submariner, commanded SPERRY (AS-12) in 1942 and was killed with Admiral English in the PanAm Clipper crash in 1943.]

> "I have this knowledge [of the submarine] but I shall not reveal its secret lest wicked men turn it to evil use to destroy ships and send innocent seamen to their deaths."
>
> Leonardo Da Vinci

Unfortunately for mankind, Leonardo's noble discretion was not replicated in other men, and over the centuries his secret got out. Which was why in 1949, a little over 400 years after that towering genius' death, I found myself as a junior officer in Key West, Florida, engaged in anti-submarine warfare tactical development and evaluation. It was a fascinating duty professionally, with operations out of Key West being the spearhead of the ASW advances of the time. All the platforms were represented in the area, including DDs, DEs, fixed wing aviation, helicopters and lighter than air—all working closely to counter the challenge. Which challenge was, in official language of that time "...the medium speed, deep diving submarine", a description intended essentially to express the capabilities of the German Type XXI submarine which, as was widely feared, had it come along earlier in WWII and in large numbers, could have profoundly influenced the Battle of the Atlantic.

As ASW officer of USS SARSFIELD (EDD 837), we operated against the best of our U.S. Navy's GUPPY submarines. One remembers especially AMBERJACK, with its oversized rudder, at the service of Ned Beach's bold and imaginative tactics. Day after day we made our attacks and had them reconstructed. For especially urgent evaluations, and where high credibility of results was sought, we fired full patterns, up to 48 hedgehogs at a crack, and afterwards tallied the actual clunks on the hull felt by our targets. There was something intriguingly graceful in those mortar patterns descending against the blue sky, almost hypnotic, not so different one imagined, from the look of stones being lobbed toward feudal castles a thousand years ago. Old fashioned—but

effective.

Came the Korean War and the tempo of ASW R&D in Key West notably accelerated. The ancient Mk 32 homing torpedoes developed at the end of World War II, and since then gathering dust at the Key West Naval Ordnance Unit, were hastily refurbished for evaluation. And even though they moseyed about at the stupendous speed of 12(!) knots, their hit percentage was very respectable against submarines still mostly imbued with WWII evasion tactics of *run silent, run deep*. The Mk 43 torpedoes were themselves coming along promisingly, as were lower frequency sonars, along with the advent of the initial rudimentary SOSUS system, all adding up to a pervasive, and justified, confidence that the submarine threat was well under control. Then in the late summer of 1955, USS ALBACORE, skippered by Jon Boyes, showed up on our doorstep at Key West to provide three weeks intensive services to evaluate what the best of our destroyers could do against it. I was fortunate to be the Surface Anti-submarine Detachment Project Officer, rode ALBACORE several times, was permitted to take the *joy stick* control on several occasions, and overall found those weeks incomparably the most stimulating time of all the years I was in Key West. With a top submerged speed of 26 knots (1/2 hour rate), a test depth of 600 feet, and a turning circle of 113 yards, ALBACORE clearly was something new in our world. In a profound way, I was struck by a foreboding sense of the future of ASW very different from that with which I had grown comfortable. In retrospect, though with no consciousness of it at the time, the genesis of my 1966 article grew from the early experience with ALBACORE. That seed germinated further, was nurtured by several years at sea with Task Group Bravo, in the early 60s, vainly chasing some of the earlier nuclear submarines, including SEAWOLF, and that was followed by three years at COMOPTEVFOR headquarters where I tracked the promise, such as it was, of our newest ASW systems coming along.

In March 1966, the month the *Long Shadow of the Submarine* appeared in the Proceedings, I was detached from COMOPTEVFOR with orders to WILKINSON (DL-5), then the focus of critical sea tests for the prototypal SQS-26 sonar. Enroute was circuitous, including stops at naval laboratories, a visit to the manufacturer's facilities and finally, a call on Vice Admiral Charles Martell. Checking the cut of my jib, easy to guess. Admiral Martell, as the first Director of ASW Programs (OP-95),

having already been two years in the job, was at the height of his effectiveness. I spent 30 minutes with the distinguished gentleman, downed the ritual cup of coffee, while the Admiral stressed the importance of WILKINSON's forthcoming tests and the corollary vital importance therefore of keeping WILKINSON off the rocks and free of other mishaps that could impact a tight evaluation schedule. At the end of our meeting, almost out the door, the Admiral checked my departure: "By the way, Smith", he said pleasantly, "I read your Naval Institute article and there was very little I agreed with". I replied that my views were based on some experience and my convictions honestly founded. He replied that he didn't doubt that and gave a farewell wave and wished me good luck.

At times I've thought back to that conversation and asked myself what it was that might have irked the Admiral most acutely. On one item I had no doubt, i.e., the paragraph wherein I denigrated the capabilities of the ASW aircraft, relegating it to "...[being] deprived of opportunities..." and fated to"...find itself roaming over the surface of an empty ocean, barren of clues." In this derogation of any strong future for the ASW aircraft I was, of course, exceedingly mistaken. I had foreseen neither the imminent sharp increase in the system capabilities of U.S. maritime patrol aircraft taking place during the 60s, nor was I so keenly aware of the profound tactical implications of the noisiness of the Soviet's first and second generation nuclear submarines. By the late 1960s, while on the staff of COMASWFORPAC, I was well positioned to observe the remarkable successes of P-3 aircraft in prosecution of Soviet submarines all across the North Pacific, both in transit and in their patrol areas. Parenthetically, it is essential to pay tribute to the enormous and inseparable contribution of the SOSUS system in making those success possible. Admiral Martell had a strong role in the upgrading of the P-3 aircraft's ASW capabilities, pushing the development of the DIFAR low frequency passive directional sonobuoy, and expediting the expansion of the SOSUS system, seeing clearly the enormous gains possible in the U.S. Navy's ASW capabilities if the foregoing programs were to realize their potential. These programs were particularly close to his heart and I understand better today what had to strike him, validly, as cavalier and uninformed dismissal of an indispensable arm of ASW.

Not to stir the pot on debate on which platform is the best to

counter the submarine, it is useful however, to encapsulate a few salient points, which were most pithily enunciated by the late Admiral Pete Aurand, that make the ASW aircraft inherently a formidable contender: (1) It can go fast, cover great areas, close datums in a short time; (2) by **not** having to operate in the same medium as its quarry, its vulnerability is greatly decreased; and (3) a corollary of (2)!), the aircraft has gravity working **for** it, i.e., its weapons and sensors merely have to **fall**, whereas an adversary submarine to dispatch a weapon **towards** its tormentor must **overcome** gravity. In perhaps some (if still unimaginable) major ASW campaign to come, it is difficult to picture any circumstances wherein the airplane would **not** have a significant role.

Obedient to Admiral Martell's injunction, I duly kept WILKINSON off the rocks and its paint unscratched. In the winter of 1967 I took her down to Mar da Plata for an obscure occasion known as the Argentine Naval Review, and there was given a translated copy of my article appearing in one of their publications under the title *Sombra del Submarino*. The Argentines, unknowingly prophetic, sadly were fated to feel the nuclear submarine's first sting in war in the loss of BELGRANO some 15 years later. Though having doubts about the SQS-26 sonar from the outset, throughout the years of its technical evaluation in WILKINSON I thought positively, doing all in my power as skipper to assure that the embattled sonar might realize its maximum potential. That having been said, it remains to be recorded that many hundreds of hours spent looking over the shoulders of the operators in the dim spaces of Sonar Control, repetitively watching the representation of its pings traveling outward to the edge of glowing scopes, only reinforced my conviction that the surface ship in ASW has certain profound, and incurable, disadvantages. Operating, as WILKINSON did, in carefully surveyed deep locations such as Area Bravo north of the Bahamas, in essentially idealized conditions—our old faithful target submarine GROUPER at periscope depth, creeping at several knots, presenting beam aspect and towing a radar reflective miniature airship from its sail—it was true that indeed fair numbers of echoes came back to WILKINSON from beyond the horizon. However, let conditions deviate even slightly from that alerted ideal, let aspect get some degrees off the beam, let a mild afternoon breeze spring up, ruffling the sea's surface and thus increasing reverberations, or even should WILKINSON

increase speed much above steerageway—then our echoes vanished and the extreme fragility of that particular sonar equation of detection became manifest. While reasonably long range detections were occasionally possible in the direct path mode when the submarine remained in the surface duct, as soon as our target descended **below** the layer, the SQS-26 sonar, for all its vaunted power, was no match for the refractive power of thermal gradients. Detection capability then reverted back to that of the typical active sonars of decades earlier, attainable ranges not being more than the usual few thousand yards.

In 1971 I had another article published in the Naval Institute Proceedings which caused some commotion. Based upon a wider database, I expressed further, and more concrete, reservations about the capabilities of surface ship ASW capabilities. Twenty more years have now passed, and surface ship ASW systems have undergone improvement. They have incorporated towed arrays, certainly an indispensable augmentation to passive detection capabilities; and they have been liberated from the otherwise inescapable tyranny of continual active transmissions, with all the well known protean counterdetection ranges they confer. However, all the advances in surface ASW **in toto** remain modest, with each improvement bringing forth ever more marginal gains in performance. In ASW, as in many facets of modern naval warfare, the surface ship's dilemma is historic and profound. What has happened is that a great wave of technological advance has overtaken all vehicles that must operate on the surface of the sea. Fated to contend in the interface of the two great media, air and water, unable to go fast in one nor able to hide in the other, inevitably the surface unit has had to yield lasting dominance to the submarine and the aircraft and the missile.

On one matter in the article, expressing skepticism towards the future potential of various non-acoustic modes of submarine detection, I can only aver, after passage of time, a greatly deepened and abiding skepticism. Yes, the physicist may validly claim that from every submarine in the sea there will be, there has to be, some coupling of energy from that ship of steel to the water. And that energy transfer in turn translates into that present buzz word, an *observable*, which is then the challenge of the system designer and the signal processor to discriminate against the ambient and to present to the operator in tactically useful form. Trouble is, non-acoustic *observables* are incredibly faint, undetect-

able except at the shortest of ranges, and if you **do** detect them—well, you are **already** virtually on top of your submarine quarry, and your tactical problem is essentially solved and there is nothing left but to let go a weapon. Nice work, if you can get it! The critical question endures: **How** did you get to that felicitous state in the first place? Surface scars, heat, radiation, wake turbulence, ionization—these and other phenomenon keep cycling through our consciousness, returning ever and anon to intrigue young minds with a sense of discovery and the enthusiasm to tackle old problems in some fresh ways. And, no doubt, that is the way it ought to be. The weight of memory cannot be allowed to deaden the curiosity of future generations. Yet at the same time, looking back across some 45 years, to young officer days, and the excitement of all the many interesting things the Key West ASW Community was trying out—yes, even then virtually all of that same phenomenology just mentioned, and interfacing regularly with crack scientists who told how in WWII they had tried to exploit all of the foregoing, plus visible light and radar (x-band penetrating sea water to 1/3 of a centimeter!)—after a while one inevitably bears a heavy load of ***deja vu***, waiting for the inevitable ardent resurrection, by those without memory, of some long ago discarded bit of obscure phenomenology. Prophecy is always rash but, in the resolute absence of any data coming out of all the rice bowls dedicated to the doubtful trail of all kinds of avenues of dim promise, it is difficult to withhold a pent up sense of exasperation from bursting forth in bold declaration: SORRY FELLOWS, IN PRACTICAL TERMS, THERE IS NOTHING THERE! Around the submarine in the depths is a vast cloaking mass of sea water of staggering impermeability to all forms of energy but acoustic.

When in late August of 1993 Jim Hay called me to express **THE SUBMARINE REVIEW**'s wish to republish my 1966 Naval Institute article, I was naturally pleased, but surprised. Living in, still **contending** in, the Washington, DC environment, where the half life of most words is usually measured in days, or a few weeks, it was gratifying that something written a full 28 years ago, dealing especially as it did partially in prophecy, might still carry some validity. I told Jim that I would go over the article to assess its views in the light of hindsight, focusing on what things therein seemed still to hold true, and those that have not withstood the test of time. The above I believe I've pretty much covered. In broad

perspective, if the article has lasted it is mainly that it stressed the submarine's one great and incomparable advantage: **Its ability to hide in the sea.**

As with most naval issues, the point can be carried with a sea story. In the fall of 1955, not long after reconstruction and analysis was completed on general purpose destroyer vs. ALBACORE tests, I was called upon to brief the results to a British admiral paying a call on the Surface Anti-Submarine Development Detachment in Key West. The results were poor in all respects, detection, holding contact and, above all, attack. From hit probabilities with hedgehogs of roughly 30 percent against the unrestricted GUPPYs, the percentage of success dropped catastrophically, was essentially nil. At the conclusion of my brief I mentioned, speculatively, that it seemed an inevitability that the next step in submarine development would be incorporation of a nuclear power plant in an ALBACORE hull. At that the Admiral—he was one of Britain's famed escort commanders in WWII—brightened with some secret mirth. "And what then!" To that I made some waffled reply for which I could sense, in the Admiral's disappointment, a certain lowering of his estimate of his briefer. I remember bushy white eyebrows springing up in arcs that amplified his question. He regarded me for more seconds of tolerant amusement with eyes that never lost their twinkle. His voice at last dropped to a hoarse stage whisper. **"Don't you see, my boy? It's all over."**

And so it was, so it is. Certainly, in the 38 years since the ALBACORE tests I have seen nothing take place that would call for any serious alteration in that profoundly pessimistic, nay terminal, judgment pronounced by that grand old warrior of the Battle of the Atlantic, whose vision of defeating the submarine had encompassed so much. ■


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ON PATROL FIFTY YEARS AGO

by Dr. Gary Weir

USS HARDER - Report of a Special Mission
Period from 26 May 1944 to 21 June 1944

[Ed. Note: During her fifth war patrol, HARDER was assigned the task of picking up a team of coast watchers from the northeast coast of Borneo. Three other submarines had tried unsuccessfully to bring out that same intelligence group. Since the rendezvous point was in the vicinity of Sandarkan, on the Sulu Sea, HARDER had to go through the narrow straits between Borneo and the Sulu Islands which stretch northeastward to Mindinao. The main Japanese fleet was at that time at the Tawi Tawi anchorage in the Sulus, about 40 miles east of the straits.

On the way to the rendezvous, Commander Sam Dealy, HARDER's skipper, ran into a force of destroyers and sank two of them. On the way back down through the straits, enroute a surveillance patrol of Tawi Tawi, he sank three more. More importantly, his anti-DD actions precipitated an early Japanese withdrawal from their anchorage; and his report of that move allowed adequate disposition of the U.S. naval forces for the coming Battle of the Philippine Sea.

Commander Dealy received the Medal of Honor for his work on that patrol, and the account of his anti-destroyer actions, in Roscoe's U.S. Submarine Operations in World War II (pages 375 to 378), is highly recommended.

It is the other part of that patrol which is reported here; in order to emphasize the importance of multi-mission flexibility to successful submarine warfare. Sam Dealy had to fight his way into and out of the rendezvous, but he did get the Allied intelligence party out with their important information. He also conducted a highly important surveillance operation in conjunction with his other missions; and, he caused significant attrition in the enemy's warfighting strength.]

ANNEX DOG TO COMMANDER TASK GROUP
SEVENTY-ONE POINT ONE
OPERATION ORDER 64-44

Special Mission

1. An attempt is to be made to evacuate six Allied Intelligence

Bureau personnel (British and Australian Army Officers) from the Northeast Coast of Borneo in the vicinity of latitude 5°-25' North and longitude 119°-02' East.

2. Major Jinkins and partner will board HARDER in Fremantle with all equipment necessary to effect the evacuation. This will consist of boating equipment and walkie-talkie radio units for communications.

3. In general, the plan is to conduct Major Jinkins and partner to the general vicinity of the area specified above. There disembark them, each in a small boat, to proceed to the beach and pick up the party on shore and return to HARDER. Recognition signals between the submarine and the shore are unnecessary. Communications between the submarine and the boats will be by walkie-talkie high frequency radio.

4. Attempt at evacuation will be made during the period 6 to 12 June inclusive. If not successful on first attempt, further attempts will again be made as deemed feasible by Commanding Officer, HARDER. The party on shore will be informed of these dates. Any directives for change in this general plan will be received from Commander Task Force Seventy-One. Minor details of execution of the general plan will be worked out personally between Major Jinkins and the Commanding Officer, HARDER.

5. Prior to departure of HARDER from Exmouth Gulf, training exercises will be conducted to insure satisfactory operation of all equipment and thorough indoctrination in details of the plan.

6. Maintain strict secrecy concerning this operation and submit separate written report to this Command upon return from patrol.

From: The Commanding Officer, USS HARDER
To: The Commander Task Force Seventy-One

Subject: Special Mission of USS HARDER

NARRATIVE: (all times local)

26 May 1944

1230 Major William L. Jinks (MBE), Australian Imperial Forces, and Sergeant Stanley W. Dodds, Australian Imperial Forces, reported aboard for duty in accordance with reference (a).

The equipment for the special mission consisted in general of the type normally carried for operations in the jungle, and two collapsible rubber canoes, provided with outboard motors and paddles and of three U.S. Army type walkie-talkies. (It is here strongly recommended that all subs be provided with boats of similar type and with several sets of walkie-talkies in order that they may be better prepared to always carry out tasks of similar nature.)

Before leaving port, one of the walkie-talkie sets was put on board USS REDFIN in order to test the equipment for strength, modulation and maximum range.

1300 Departed Fremantle in company with USS REDFIN in compliance with dispatch orders.

Enroute Exmouth Gulf held day and night test of the communication sets with results as follows:

Day Test
Maximum range: 13,000 yards
Strength: 4
Modulation: Good

Night Test
Maximum range: 7,000 yards
Strength: 3
Modulation: Only fair

(Much static and several different, distant stations prevented good reception.)

May 29, 1944

0800 Arrived at Exmouth Gulf.

1400 Held drills in quick assembly of the collapsible boats and tested the boats and their outboard motors.

1500 Sent boats out from submarine and found that our SJ radar could not detect them at ranges beyond 1000 yards.

A radar target was therefore devised, consisting of a wire mesh screen secured to a 3'x3' frame and made fast to an oar which could be raised to a height of 10 feet. Credit for this device should be given the Executive Officer, Lieutenant Commander F.C. Lynch.

2200 Assembled all equipment and held a *dress rehearsal* of the special mission to be accomplished. The radar target worked perfectly. When held aloft by a man in the boat, our radar was able to take bearings and ranges out to 5,600 yards, although the canoes had disappeared from sight at 500 yards. Walkie-talkie communication was used to advise the proper courses which the boats should steer enroute to the beach and when returning to the submarine.

May 30-June 8, 1944

Enroute to area for special mission, detailed plans and alternative plans were worked out with Major Jinkins.

Our two day late arrival at the designate rendezvous was occasioned by torpedo attacks which resulted in the sinking of two Jap destroyers and a thorough arousing of the hostile nature of six more destroyers assisted by night flyers who held us down in Sibutu Passage.

June 8, 1944

1400 Arrived off rendezvous and made periscope reconnaissance of the coastline, and a study of prominent peaks and coastal currents for navigational purposes.

1940 Surfaced. Remained flooded down to deck level with propulsion on the batteries, and moved in toward the coast.

2015 Assembled boats and all equipment topside and made last minute preparations.

2139 With one fathom of water under the keel and bow pointed toward the beach 6,500 yards away, put boats in the water.

2140 Major Jinkins and Sergeant Dodds embarked in boats and

shoved off. Radar contact on the screen, held aloft in the leading boat, was maintained out to 5,400 yards and the boat was guided toward its prearranged landing point by walkie-talkie communication.

The moon was full, visibility like that in daytime, and the bridge watch was doubled with attention concentrated on looking for night flyers and enemy patrol craft.

Radar navigation made it easy to keep the ship in its proper position.

2318 Received communication from Major Jinkins stating that the party ashore had been contacted and had replied with the proper signal.

June 10, 1944

0125 Rescue boats returned to ship with the following listed officers and men:

Major Chester, British Army
Lieutenant Woods, Australian Imperial Forces
Warrant Officer Chew, Australian Imperial Forces
Sergeant Cottee, Australian Imperial Forces
Sergeant Olson, Australian Imperial Forces
Sergeant Neil, Australian Imperial Forces

All were in good spirits and apparent fairly good physical condition except for the fact that all were slightly starved and in need of much rest. It is doubted if succeeding events on HARDER provided the latter requirement. Enroute to Darwin, Major Chester, Lieutenant Woods, and Sergeant Cottee suffered several recurring attacks of malaria.

Major Jinks and Sergeant Dodds were adopted 100 percent as members of the crew. Their carefully planned and courageous rescue of the comrades won the respect of officers and men alike on HARDER. Both offered to share a part of the work on the cruise and Major Jinkins stood watches as JOOD while Sergeant Dodds took his turn as lookout. Both did their jobs well, and the Major showed a particular adeptness in submarining. Though his ambition to qualify as a submariner during the patrol lacks the

essential elements of time and experience, his presence aboard was of definite benefit to the ship and all aboard are proud to have served with him. Any ship to which he may be assigned for other special missions can be sure that his presence will be an asset to the ship.

June 11-16, 1944

In assigned operating areas.

June 17, 1944

Enroute Darwin.

June 21, 1944

Arrived Darwin and disembarked passengers. Special mission completed.

S.D. Dealey

From : Major W.L. Jinkins, MBE
To: Commander Task Force Seventy-One

Subject: Special Mission of USS HARDER (SS 257)

1. The following is a report on the special mission which consisted in picking up a party of six officers and NCOs from the northeast of B.N.B. This mission was carried out from USS HARDER (SS 257) on the night of 8 June 1944.

The report covers only the sequence of events of the mission between the hours of 1830, 8 June to 0145, 9 June 1944.

The mission was carried out by Major W.L. Jinkins and Sergeant S.W. Dodds of the A.I.F. with the able and very cooperative assistance of the captain, officers and all members of the crew of USS HARDER.

2. At 1900, 8 June 1944, two Folboats (special canoes to be used for the operation) were made ready in the forward torpedo room and all accessories assembled ready for passing through the forward torpedo room hatch to the deck.

HARDER, at this time, was underway on the surface and making 1/3 speed on the batteries toward a preselected position approximately 6,000 yards north of the shore rendezvous.

At approximately 2055, the canoes were passed topside. Major Jinkins and Sergeant Dodds, together with assistance of V.L. Dallessandro, TM1C, USN and W.F. Young, TM2C, USN

(both members of HARDER crew), completed the assembly of the canoes. The accessories were then passed topside and stowed in their respective places in the canoes.

Final bearings and the range were checked with Lieutenant Commander F.C. Lynch, Jr., USN, the navigator. A course of 158° magnetic, at a range of 7,500 yards from the shore, rendezvous was established. The canoes were launched from this position at 2140; the course set on the compass and the paddling to shore commenced.

3. The weather conditions were ideal for the execution of this type of operation:

Wind	-	Very slight
Water	-	Smooth
Sky	-	Cloudy and overcast
Moon	-	Full (moonrise at approximately 2130)
Tide	-	Slight westerly set.

4. At 1200 yards range, a radar range and bearing check was made by voice with the walkie-talkie sets. This check was made by voice and repeated from time to time up to 5,000 yards when radar contact for some unknown reason was lost (believed to be due to the proximity of the trees on the land, all low lying, some 2,500 yards from the canoes.)

5. A green light was flashed to sea in the direction of the submarine to check the bearing; the bearing was found to be correct and the paddling proceeded. Direction was maintained quite accurately by means of a P.8 Air Force compass and by the stars. At approximately 600 yards from the shore, contact with the sub was again established; the sub was informed that the light signal to shore was about to be flashed.

6. A white light was flashed directly on the compass bearing ashore, a pause of a few seconds and the light was again flashed on the position ashore. No reply. The light was then moved in an arc of 10° left and 15° right to cover the immediate vicinity of the coast and then returned to the first position. This time a light flash was seen from the shore at the exact spot. The letter *V* for Victor was flashed ashore to which was replied *Y* for Yoke; a *B* for Baker was flashed ashore and the commentary of the proceedings was given to the submarine by radio. Indication that the

canoes were then proceeding ashore was also given the sub. The radio was secured and the canoes paddled in-shore to approximately 100 yards from the mangroves. The water, at this stage, was less than six inches deep with a soft, thick, mud bottom.

Radio communication was again opened up with the sub and light contact with the shore party reestablished.

7. Voice contact was then established with the shore party and an open circuit maintained with the submarine. The first challenge, "Who are you?" was replied to by "Gort". This reply was recognizable by the voice as being that of Major Chester. The second challenge made was, "Is Alec with you?" The answer was "Yes" in Warrant Officer Second Class Chew's voice was heard. Chew was then asked who his Platoon Sergeant was (he having had one). The reply was "Doddsie". This reply was correct and proved beyond doubt that the party ashore was the *Python Party*.

8. The canoes were paddled approximately 20 yards closer ashore where they grounded. The shore party were then told to walk out. The mud was too thick to allow the party to walk; they were compelled to crawl through the mud and water to reach the canoes. At this stage, Sergeant Dodds transferred to the towing canoe.

The submarine was informed that everything was as planned and that the return trip would commence in five minutes.

Major Chester was the first to arrive at the canoes, then Lieutenant Woods, Sergeants Cottee, Olson and Neil. Warrant Officer Chew was not in sight and did not answer a call to him. Sergeant Dodds was asked to go to his assistance; this he did and found Warrant Officer Chew on his way out, he having delayed to bury his weapons in the mud.

All men were in various stages of exhaustion on reaching the canoes. The sub had been informed that the party were on their way out and that the return would be commenced within five minutes. This was not done owing to the excitement and fatigue of all concerned. The return to the submarine was commenced at approximately 0025. The shore party were covered with mud and were advised to throw their clothes away to avoid both the bad smell and bringing the mud aboard the sub. This was done by Major Chester and Warrant Officer Chew; the others being too excited or tired to comply. The canoes were pushed into deep water and all personnel embarked. Sergeant Neil, Lieutenant Woods, Major Chester in No. 1 canoe. Sergeants Olson and

Cottee and Warrant Officer Chew in No. 2 canoe. Both outboard motors were set up on No. 1 canoe owing to the loss of the outboard cleat from No. 2 canoe. No. 2 canoe was taken in tow. The port motor was started, the radar screen held in position and the 7,500 yard return trip was commenced at approximately 0030.

9. It was found that one man cannot safely manage two motors on one canoe so the starboard motor was rigged in and not used. Communication with the submarine had not been opened again owing to the difficulty of transmission when the motor was running. Although, radar contact was regained by the sub at 3,000 yards at 0055.

10. The compass course was reversed and steered on until the sub became visible, the course was then changed 6° left and steered on until 0125 at which time the canoes were separated and hauled alongside HARDER. The party was given a rousing reception aboard, then taken below. The canoes were taken aboard and HARDER put to sea. The canoes were then dismantled and stowed below. This was completed by 0145.

The shore party took a hot shower and were then treated to a supper party especially prepared for their benefit. This being just another of the many considerations by the captain of HARDER for the comfort of the visitors.

11. A total mileage of 1,096 miles to reach the pickup area, a total of 4-1/2 hours operational time and the Special Mission had been successfully completed.

I would like here to report and express, in writing, my sincerest appreciation to the captain, all officers, and all members of the crew of USS HARDER for their able assistance and cooperation prior to, during and after the completion of the mission. Also, to Admiral W.C. Christie and members of his staff for the opportunity to travel by a U.S. submarine to attempt this mission.

W.L. Jinkins

PERSONAL: TO THE CNO

November 29, 1993

Admiral Frank Kelso, USN
Chief of Naval Operations

Dear Admiral Kelso:

This letter from a former shipmate is long overdue. Too much time has passed without my telling you how proud we are of your extraordinary service to the Navy and to our country.

Twice in the past two years I began letters to you to express my personal admiration and gratitude for your leadership of our Navy during incredibly changing and challenging times. The letters were not sent lest they be considered *sucking up to the boss*. I regret having not finished those letters—I will finish this one.

For over 30 years our leaders were challenged with ensuring that our nation created and maintained war-deterring and war-fighting capabilities superior to those of the Soviet Union. Many of our leaders' terms of office called for maintenance of our capabilities rather than creation of new ones. Our goal was clear...beat the Soviets. Leaders' plans and new ideas were measured against this clear goal, and most plans and new ideas amounted to incremental improvements on the incredible developments in the 1950s of the nuclear submarines and submarine launched ballistic missiles that assured our deterrence and fighting capabilities.

On the other hand, your term of office has been characterized by unpredicted and unpredictable global changes and a fast changing set of domestic priorities. How much harder it is to lead when the principal enemy will not stand up and identify himself. For sure, one's plans and ideas will be measured by a wide variety of yardsticks when no single overriding goal or requirement is clear.

In this sea of unbelievable change, you have been challenged repeatedly and you have proven to be a man of great vision and courage in setting the Navy and the country on new courses to steer. From your tactical successes as an area commander in the

Middle East, to your courageous overhaul of the Navy organization to better compete in the post Cold War era, and to your development of the first new-era naval warfare strategy, the country has been so very fortunate to have you at the helm.

I assure you that today's Tailhook-associated publicity cannot shake the faith or admiration or respect of your former shipmates. We who have been fortunate to work beside you know of the extraordinary integrity, dedication and abilities you have always applied to serving our Navy and our country. Please know that you have hundreds of well informed, unshakable supporters for every possible detractor. Unfortunately, the detractors have a greater access to the public's attention because they purvey *news* of tabloid level interest. But then, that's the nature of this wonderful country that you have so skillfully served with unflagging dedication.

God bless you and Landess—don't let the buggers get you down.

Very respectfully,
/s/ Kenneth A. Lee
CAPT, USN(Ret.)

A WORLD WAR I LOSS

Re the *To the Bottom of the Sea - and Back* reflections piece in July 1993 The Submarine Review, I'm reminded of a bit of information I picked up from my friend, Gus Britton, at the Royal Navy Museum in Gosport, England a few years back.

During World War I, LT Earle W.F. Childs, USN, was serving aboard USS L-2 (SS 41) in the Irish Sea area. On March 2, 1918 he was temporarily assigned to HMS H-5 for an instructional cruise. That night at 2030 hours the British H-5 was accidentally rammed. It sank with all hands off Liverpool, England. Among them LT Childs and three British officers, along with 19 enlisted, one of them a 16 year old telegraph operator. On 3 January 1919, L-2 (known as AL-2 in foreign waters) departed Portland, England for the States without LT Childs, perhaps the only US submariner lost in WWI.

/s/ Martin F. Schaffer

A REQUEST FOR INFORMATION

For the last three years I have been researching an incident which involved a pre-World War II Russian submarine. The submarine is a small coastal submarine—an M Class Series VI-BIS (1935). None of the publications by authors I am familiar with (Norman Polmar, David Miller, etc.) have anything on the internal layout and construction of these boats. If any of your readers are aware of where I could obtain this information, and would provide it to me, it would be greatly appreciated.
Thanks for your assistance.

Sincerely,
Donald C. McElfresh
9121 Summer Glen Land
Dallas, TX 75243
Tel: (214) 343-8337
Fax: (214) 343-3059

February 12, 1994

Dear Naval Submarine League Member:

I have recently begun a research project in which I intend to study the 52 U.S. submarines which were lost in action during the Second World War. It will attempt to tell the story of these boats from their commissioning through their loss. Sources I anticipate using include the official records of war patrols prior to the boat's loss, deck logs, muster rolls, messages to and from the boats while on patrol, previously written reference works and books, archive photos, and oral and written histories and remembrances of the men who served on them prior to their loss.

While being as factual as possible with regards to operations, it is my intention to tell the stories of the boats through the eyes of the men who served on them. Now, 50 years after the fact, it is going to be very difficult to do that, since many of those who survived the war have passed from us. But hopefully many of you who remain will wish to tell your stories. I intend to compile this study into book form.

If you served on any of the 52 boats which were lost during the

war, I would very much like to hear from you. I am interested in learning about the time you spent on any of these boats which are *still on patrol*. Specifically, what was your job, whom did you serve with that you were close to, what was daily life like in general, your impressions of your boat and shipmates, battle experiences, shore experiences, memorable characters and simply anything and everything you wish to say regarding your tour. In addition, I'd be interested in seeing diaries you might have kept and any artifacts or mementos you have from your time in submarines.

If you did not serve on one of the 52 lost boats, but still have remembrances to relate, I would like to hear or read about them also. The more material about life in the boats, combat and otherwise, the more understanding I will have of my subject.

Should you wish to participate, please contact me at the address and/or phone number below. You may write to me, call me, or if you would prefer, I would be happy to arrange a time when I could meet with you.

I look forward to hearing from you soon.

Sincerely,
Jack Mark
201 South Main Street #900
Salt Lake City, UT 84111
(801) 350-9140

CORPORATE SPONSORS IN THE SPOTLIGHT

Treadwell Corporation
Member Since 9/27/83

When the concept of NAUTILUS was publicized in the early 1950s, Treadwell recognized that nuclear submarines would require oxygen generating equipment in order to eliminate the large oxygen storage systems needed for long submergences and their incidental logistical support. BuShips awarded Treadwell a development contract in 1953 and a prototype electrolytic oxygen generator was approved in 1958—just in time for GEORGE WASHINGTON.

All subsequent submarines have had either one (SSNs) or two generators (FBMs), and Treadwell facility in Thomaston, Connecticut is completely dedicated to the building and overhaul of the equipment as well as spare parts and field service support.

The enviable record of the generators, particularly in strategic submarine patrols, where approximately 3,000 patrols totalling 5,000,000 man-hours of operation have been logged, is a tribute to the Navy's confidence in small business suppliers.

Booz-Allen & Hamilton
Member Since 3/14/83

Founded in 1914, Booz-Allen & Hamilton has been supporting Navy submarine programs for over 30 years. When the Navy accelerated the POLARIS program in the late 1950s, Booz-Allen, in conjunction with the Navy's Special Projects Office and Lockheed, developed the Program Evaluation and Review Technique (PERT) to track the design and construction efforts taking place all over the country. PERT is now a standard business tool for defining steps in disparate work processes and identifying the critical path for on-schedule delivery of an entire project.

Booz-Allen won its first contract on the TRIDENT program in 1975 and has been providing continuous support to the SSBN Strategic Submarine Program Office since that time. Booz-Allen

helped the Navy evaluate the OHIO Class construction and launching techniques, as well as the design of the weapon support systems, which had to accommodate both the initial C4 and the subsequent larger D5 missiles. Support continues through each new ship's shakedown and post-shakedown availability (PSA), and includes an evaluation of OHIO's systems after more than a decade of continued operation at sea.

Booz-Allen supports the UK TRIDENT submarine program in design development, ship definition studies, weapons interface, program planning, and acquisition. For the SEAWOLF program, the Firm has developed PSA planning and efficiency tracking and resolution systems, and is currently assisting the New Attack Submarine Office in meeting acquisition system requirements. Booz-Allen also assists allied nations in modernizing their submarine fleets.

Booz-Allen's work on Navy submarine programs includes the planning and design of the submarine bases at Bangor, Washington and Kings Bay, Georgia. The Firm has also evaluated emerging technologies such as fiber optic tow cable links, expendable buoys, ice penetrating buoys and antenna deployment, retrieval, and storage systems and has developed wargame models to simulate global naval campaign issues.

Booz-Allen's 30-year partnership with the submarine community reflects the breadth and depth of vision of the Firm's founding partners and the quality and versatility of its staff. The Firm looks forward to supporting the submarine community into the 21st century. ■

REUNIONS

USS QUILLBACK (SS 424) - September 26, 1994
USS TRUTTA (SS 421) - October 1, 1994
Please contact: Russ Russell, 6000 N.E. 22 Way, Apt. 7B
Ft. Lauderdale, FL 33308

USS SEA LEOPARD (SS 483) - August 18, 1994
USS SIRAGO (SS 485) - August 19, 1994
Both reunions in Portsmouth, NH. Please contact:
Wendell Rausch, Box 14, Akeley, MN 56433
(218) 652-2441

USS TRITON (SSN 586) - October 7-9, 1994, Groton, CT.
Please contact: Ralph A. Kennedy, 89 Laurelwood Road
Groton, CT 96340 (203) 445-6567

NAVAL SUBMARINE LEAGUE
HONOR ROLL

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NEW ASSOCIATES

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LCDR Terence Henn, USN
CAPT Arthur F. Rawson, Jr., USN(Ret.)
CAPT R. Thomas Skelton, USNR

USS BOWFIN SUBMARINE MUSEUM & PARK

The Waterfront Memorial at USS Bowfin Submarine Museum and Park in Honolulu, Hawaii stands in tribute to the 52 US submarines and almost 3,600 submariners who made the ultimate sacrifice for their nation during World War II. The memorial is composed of 53 marbleized monuments arranged in two concentric semi-circles surrounding a central raised ceremonial dais. Fifty-two of the monuments bear an enamelled plaque chronicling the wartime career of each of the lost submarines and listing the names of the officers and enlisted men who are *on eternal patrol* with their vessels. A fifty-third plaque lists those submariners who died in individual tragedies during the war.

Sponsors are still needed for plaques for the following submarines:

USS Albacore (SS 218)
USS Bonefish (SS 223)
USS Bullhead (SS 332)
USS Cisco (SS 290)
USS Darter (SS 227)
USS Dorado (SS 248)
USS Escolar (SS 294)
USS Flier (SS 250)
USS Golet (SS 361)
USS Grenadier (SS 210)
USS Grunion (SS 216)
USS Harder (SS 257)
USS Herring (SS 233)
USS Lagarto (SS 371)
USS Perch (SS 176)
USS Pickerel (SS 177)
USS R-12 (SS 89)
USS S-26 (SS 131)
USS S-27 (SS 132)
USS S-28 (SS 133)
USS S-36 (SS 141)
USS Sculpin (SS 191)
USS Sealion (SS 195)
USS Seawolf (SS 197)
USS Shark (SS 174)
USS Shark (SS 314)
USS Snook (SS 279)
USS Tullibee (SS 284)

Entire plaques may be sponsored by individuals or organizations for $650.00 or contributions in any amount may be made to the General Fund to support the Memorial project. For more information, please contact Ms. Aldona Sendzikas, Museum Curator, at 11 Arizona Memorial Drive, HI 96818, telephone number (808) 423-1341 or fax number (808) 422-5201.

ASSIGNMENT UPDATE

The following changes to Senior Submariner assignments have been announced since publishing our **NSL FACT AND SEA STORY BOOK 1993:**

ADMIRAL BILL OWENS was diverted from **CINCPACFLT** and now is **Vice Chairman, Joint Chiefs of Staff**

ADMIRAL HANK CHILES has been confirmed as **CinC US Strategic Command**

REAR ADMIRAL GEORGE STERNER will relieve as **Commander, Naval Sea Systems Command**

REAR ADMIRAL DICK RIDDELL has orders to **Director, Special Programs Division (N89), OPNAV**

REAR ADMIRAL RICK BUCHANAN will assume duties as **COMSUBGRU TWO**

REAR ADMIRAL AL KONETZNI has assumed **Assistant Chief of Naval Personnel for Total Force Programming and Manpower (PERS-5)**; assumption of additional duties as PERS-2 anticipated

REAR ADMIRAL (SELECT) JOHN GROSSENBACHER is slated as **Director, Attack Submarine Branch (N872) OPNAV** (from COMSUBRON EIGHT)

CAPTAIN CHUCK MAYER, JR. will become **Director, Strategic Submarine Division (N871) OPNAV**

CAPTAIN PETER HENRY will relieve Captain Steve Zavadil as **COMSUBRON SIX**

CAPTAIN JIM HOLLOWAY has relieved as **COMSUBRON EIGHT**

CAPTAIN JAMES DURHAM will relieve as **COMSUBGRU ONE** (April/May)

CAPTAIN THOMAS J. ELLIOTT will become **Chief of Staff, COMSUBPAC** (from COMSUBGRU ONE)

CAPTAIN TOM TRAVIS will relieve Captain Chuck Reigner as **COMSUBRON ELEVEN** this summer

IN THE NEWS

- Jane's Defence Weekly, October 9, 1993

"Project 885, the new fourth generation advanced Russian nuclear powered attack submarine, will make its first appearance in the later 1990s, the USA believes.

Little is known about the submarine which will succeed the AKULA Class. Three uniquely shaped keel plates were recently observed at the Severodvinsk shipyard, leading the USA to conclude that development is being completed and initial construction may be underway.

The plates were narrower than those for the AKULA or OSCAR Class but a maximum beam of 10.5 m to 11.5 m is believed to be part of the new design. Some intelligence sources believe the new design must be larger than the AKULA to accommodate advanced *quieting* capabilities.

The hull is expected to be laid down next year with an initial operating capability in the year 2000. All nuclear powered submarines are now constructed at Severodvinsk. Rear Admiral Edward Sheafer, Director of US Naval Intelligence, told Congress earlier this year to expect Russia to build a new attack boat to maintain a credible sea-based nuclear deterrent."

"There are also indications that Russia continues to market the Amur Project, a design for a follow-up to the KILO Class export submarine. The USA believes Moscow does not yet have orders for it."

- Inside the Navy, December 13, 1993

"Navy officials are in the process of scrubbing all of their acquisition programs to see which ones are potential contributors to the recently announced Defense Counter Proliferation Initiative. The initiative is aimed at protecting troops from nuclear, biological, and chemical weapons. A senior defense official last week told Inside the Pentagon that John Deutch, the Pentagon's top acquisition executive, is prepared to take money away from existing service programs that support Cold War era missions and put that money toward the new counter-proliferation initiative."

"One area the Navy may play a significant part in is attacking buried targets. The senior defense official said the services are being asked to put forth weapons that can fulfill this mission. "[We need] non-nuclear penetrating munitions for attack on buried

targets, because many of these countries' proliferators are using hardened underground structures as a refuge, either to build or to operate special weapons arsenals from," he said.

The Navy has two programs that may meet this need: the Tomahawk cruise missile, and a submarine launched ballistic missile equipped with an earth penetrating warhead, according to service briefing documents and Navy sources. The Tomahawk baseline improvement program includes plans to develop a hard-target warhead that would have deep penetrating abilities, a Navy source said. This option is listed in the Tomahawk's operational requirements document as a capability but the work is in the "let's think about it stage," the source said. In addition, the Tomahawk could be used to deliver surveillance sensor packages that would contribute to intelligence gathering.

The use of a conventional submarine launched ballistic missile (SLBM) with an earth penetrating warhead may be one of the best assets the Navy has. The submarine's inherent stealth capability makes the launch platform highly survivable. The Navy recently tested a conventionally-armed SLBM and has publicly stated that its TRIDENT submarine fleet could carry a mix of conventional and nuclear SLBMs."

- Navy News and Undersea Technology, December 27, 1993

"If you never took a cruise aboard a Navy submarine, but always wanted to, know you have another chance. An Anacortes, Washington company is advertising a new wrinkle in pleasure boating—the submersible yacht.

U.S. Submarines Inc. offers a civilian skipper with deep pockets the chance to buy his own submarine. Looking like an Italian-designed yacht when on the surface, the sub can go down to a 1,000 foot test depth.

Of course, the luxury sub will not remind a Navy veteran of any sub he ever served on. The Nomad 1000—the larger of the two models being designed—is 65 feet long with a beam of 12 feet. It sleeps six and provides showers, wool carpets, wood trim, and plenty of headroom.

The ship could stay down for 10 days without surfacing. "The joke here is that we fun out of food before we run out of air," said Ellis Adams, U.S. Submarines' vice president."

- Defense News, January 17-23, 1994

"Washington — Delaying development of the Navy's New Attack Submarine (NAS) seriously jeopardizes plans to begin building the first submarine by 1998 and could result in construction of additional SSN-21 SEAWOLF Class submarines later this decade, military and industry sources said.

In a January 12 meeting of the Defense Acquisition Board (DAB), John Deutch, Undersecretary of Defense for Acquisition and Technology, rejected the Navy's plans to begin developing NAS and instead raised critical questions over the submarine's cost and future performance, defense sources said.

The delay could range from several weeks to six months or even up to a full year, defense industry sources said. Deutch is chairman of the DAB, the Pentagon's high-level body that reviews and approves all major acquisition programs for development and production.

With the delay, "The 1998 start date is somewhere between at risk and virtually out of the question," Ronald O'Rourke, a naval analyst with the Congressional Research Service, said January 14.

The estimated $4 billion to $5 billion cost to design and develop the first NAS is a key hurdle that Deutch is questioning, defense sources said."

- New York Times, January 20, 1994

"Tokyo, January 19 — North Korea has quietly begun purchasing 40 aging attack submarines from Russia's Pacific Fleet through a small Japanese trading company, according to Japanese, South Korean and American officials tracking the movements of the subs through the North Pacific.

Military and intelligence experts have offered conflicting explanations for why North Korea would want leftover hulks of the Russian Navy. Some experts raised the possibility that North Korea could try to restore the submarines to bolster its fleet, or cannibalize them for spare parts; Russian officials insist that the vessels are being sold to the Communist government of President Kim Il Sung solely for use as scrap metal.

Skeptical about the Russians' explanation, the Clinton Administration has pressed the Russian Embassy in Washington for more details."

"In an interview today, the president of the Japanese company acting as the intermediary in the deal, Toen Trading Company, said the submarines were being towed intact from Russian naval

bases in Vladivostok to the nearby North Korean port of Najin, a major naval base on the Sea of Japan.

"Everything is left as it is" on the submarines, the executive, Ariyoshi Shibata, a Japanese citizen of Korean descent, said today. "Nothing is removed." But he said his North Korean partners, whom he declined to identify, had no intention of adding the submarines to the North Korean fleet and were already cutting them up for scrap."

- Underwater News & Technology, January/February 1994

"A team of international experts have inspected and surveyed the area in the Barents Sea where the Russian 8,000 ton titanium-hulled submarine sank five years ago. The Russians had planned to raise the sub from its resting place more than 5,000 feet deep. However, experts devised that if the sub broke up during recovery the risk of nuclear contamination could be great. The Norwegian service company Sonsub has offered to seal the hull, reactor and torpedo tubes preventing any radioactive leaks from occurring. The cost of this approach would be about $6 million versus the possible $200 million for recovery."

- Defense Week, February 7, 1994

"The Pentagon's top acquisition executive is calling for an unusual, independent review of the Navy's newest multi-billion dollar nuclear submarine program, a move that suggests the Pentagon may have serious concerns about the fledgling effort.

John Deutch, the Undersecretary for Acquisition and Technology, has asked for a non-partisan panel of "outside technical experts to review the [new CENTURION submarine] baseline design's ability to perform its military missions from the view of its major characteristics of speed, quieting, payload, combat system and cost represented in the baseline design."

"This review should provide an independent check that we have asked all the right questions, and I anticipate it will help equip us for questions we will face later in the spring during congressional budget hearings," he wrote January 24.

Deutch made the request to Nora Slatkin, the Navy's Assistant Secretary for Research, Development, and Acquisition. The letter was obtained by Defense Week.

Underscoring the Pentagon's resistance to the Navy's preferred CENTURION design, Deutch also directed the Navy to consider

six alternative submarine building programs and schedules.

The two-page note helps flesh out the reasons behind Deutch's January 12 Defense Acquisition Board decision to delay sending the CENTURION into the demonstration and validation phase of the acquisition cycle."

- Inside the Pentagon, February 8, 1994

"The Clinton Administration Monday sent Congress an FY95 defense budget request of $252.2 billion that reflects the continuing shift in defense priorities the President is advocating.

The Pentagon is asking about $300 million for potential peacekeeping activities; $400 million for aid to the former Soviet Union; and $30 million for the defense-wide Counter Proliferation Initiative, which is aimed at halting and responding the spread of weapons of mass destruction.

Procurement funding is down from previous years because the Pentagon "can live off [of] stocks we bought in the '80s," a senior Pentagon official said during a February 5 background briefing. The budget cancels the production of four Navy helicopters, the Air Force's F-16 fighter, and the Follow-on Early Warning System. The Army's Multiple Launch Rocket System and Avenger programs are also killed.

When the budget was put together, the number one priority was the readiness of the three services, the DOD official said. To guard against a drop in the readiness level, the Clinton defense budget increases operation and maintenance funding 5.6 percent over FY94, an increase of $5 billion for a total O&M request of $92.9 billion."

- Navy News & Undersea Technology, February 28, 1994

"Sydney, Australia — Sea trials for the lead ship of Australia's COLLINS Class submarine will be delayed about six months due to software problems in the ship's sophisticated combat system.

Because the combat system is on a $715 million fixed-price contract, the delay will not cost the government additional money. Sources close to the program indicate the delay was anticipated because the Ada computer language software compiler was late, as were revisions to the original software.

"We recognized from day one we would have problems with software," said an industry source. "The trials program will start about six months late."

The late start of sea trials marks the first delay in a program that was conceived in 1982, with contracts awarded in 1987. Rockwell Systems of Australia is the prime contractor for the combat system, overseeing the work of 26 subcontractors.

However, the source indicates work is proceeding well on the remainder of the contract. The keel of the fifth boat in the six-ship class was laid earlier this month.

The software-induced delay caused a small tempest in the Australian press because the program was widely believed to be on time and budget. Sources close to the project indicate the entire effort is proceeding exceptionally well, and anticipate the final ship will be delivered about one year ahead of schedule, with the total program running about 3 percent below budget."

■

WAR AND ANTI-WAR

Survival at the Dawn of the 21st Century
by Alvin and Heidi Toffler
Little, Brown, & Co., New York and Boston
302 pages, $22.95
ISBN 0-316-85024-1

Reviewed by Ralph Chatham

Sweeping generalizations about forces in history can lead to monumental human catastrophe. The danger appears when people start believing the intrinsic truth of an historical construct instead of seeing it as a framework within which to organize apparently unrelated facts. Manifest Destiny of our American past, and the far more deadly mock scientific theories that justified the former Soviet Union, gave vast populations the unjustified belief that their actions were sanctioned by some natural law of human history. The Tofflers are not likely to gain a fanatical following, but we must tread with caution through their myriad of intriguing observations and slogans.

This far-ranging book begins and ends with a quote from Trotsky, "You may not be interested in war, but war is interested in you." The authors do not approach their subject from either extreme; they steer a laudable course between the hawk and the dove. I cannot, however endorse the whole of their projected track. The text that resides near the twice quoted sentence is full of insights worthy of our critical attention; the middle, though more superficial, still forces one to think.

A sample of their early insights: "If war is too important to be left to generals, then it is also too important to be left to the ignorant." The face of commerce and of war is changing at a rate far faster than our ability to internalize it. The Tofflers help their readers rise above ignorance of war in one sense, but their last few sobering chapters leave me concluding that war and its prevention must inevitably be left to the ignorant. War and the paths that lead to it have always been chaotic processes—tiny, unpredictable, unknowable conditions lead to enormous consequences. ["For want of a nail...a kingdom was lost."] The world condition is, more often than not, unstable and this leads to an

inability to predict the consequences of our most carefully thought-out actions. Regardless of how knowledgeable our leaders might be, they cannot avoid remaining ignorant. There are some things that can be confidently predicted, however. One of these is that rules of war and of peace that worked in the last age will not be particularly applicable to the information age.

The Tofflers are the authors of *Future Shock*. Over a decade ago, they also wrote *The Third Wave* in which they contended that the world had for almost two centuries been divided into two cultures, an agricultural one and one based upon industrial mass production. The *third wave* of their title is an emerging new culture based upon information technology. As a central theme of *War and Anti-War* the authors try to hammer the notion of three cultural waves over the subject of war and its counters. It is not a perfect fit.

A culture's methods of making wealth, they say, are also their methods of making war. Stripped of the slogan format, this notion is not particularly profound. A civilization will make use of whatever tools are available in any of its endeavors including both war and commerce. Paraphrasing Norman Augustine (*Augustine's Laws*) "If all you have is a hammer, every problem begins to look like a nail." Some of the tools of the second, the mass production, wave were invented for war, and later flowed to commerce, not the other way around. The same is true, in part, for the tools of their third, information, wave.

The important theme of the book, however, is that the changes in the tools of war are out-pacing changes in the tools of anti-war, by which they mean *controlling and preventing war—not* the anti-war of the protesting 1960s and '70s. It is a vast theme; I find it hard to capture the breadth and flavor of a book with five full pages in its table of contents. Here is a small sampling of the 25 major chapter headings: Third Wave War, A Collision of War Forms, Niche Wars, Robot Wars, War Without Blood, The Knowledge Warriors, The Future of the Spy, Spin, The Zone of Illusion... Yet for all the breadth there is virtually no mention of naval war. Submarines, the thorough index claims, are mentioned nine times throughout the book, but a review of citations finds that most were cases where *submarine* was mentioned in a collective phrase like "aircraft, ships and submarines". One citation was about nano-robots which would "operate like submarines in the bloodstream". The ninth reference is to heat from "submarine

volcanoes".

The major failure of the book, however, is an attempt to squeeze the irregular shaped world into their three sided, cultural wave hypothesis. The reader would be better served without rigid insistence on that thesis. Nevertheless, the value of a grand-sweep-of-history theory is in how it sets a context for further thinking and provides a vocabulary with which to deal with complexity in the world. In that they have succeeded; their third wave thesis seems to have helped support the revolution in thinking in our Army over the last 15 years.

The authors started at the top in their personal rise from ignorance of war. They began by talking with Generals Don Morelli and Donn Starry as those innovators were changing the character of the Army by the introduction of maneuver warfare and the AirLand Battle. Morelli came to them after encountering their book on the third wave. The parallels between the Toffler's thesis of three waves of civilization and the revolution the general was trying to inspire impressed Morelli to the point that he made *The Third Wave* required for his staff.

I make no claim to be an expert on AirLand warfare, although I was at the Defense Science Board as they cheered on Starry's and Morelli's efforts in the early '80s. I found their discussions on the subject fascinating. Unfortunately, in among the well annotated, good and wholesome stuff I also encountered a mass of unsupported assertions and toss-off slogans. On subjects where I *do* have some detailed knowledge, there were far too many claims that made me cringe at the authors' misapprehensions of technology. A few examples follow:

- In the section on robotics in war they quote extensively from *War Without Men* by Steve Shaker and Alan Wise. The material upon which that book was based dates back to 1987 and in the changing world of information technology, that is old. Yet the Tofflers did not contact Shaker whose thinking had evolved considerably in the interim.

- Their talks with and about the special forces suggest that the authors are not good at distinguishing between those who have great hopes for technology and those who understand what is real and possible.

- They claim that the notion of chain of command hierarchy for warfare came from the way wars were fought 1000 years ago. A short dip into 14th century history will quell any notions of a 1000 year old legacy of a chain of command.

- Over and over when they describe the wonders of potential future technology, they ignore the costs thereof.

- A curious lack: no mention of the National Training Center despite numerous, well indexed, references to simulation and training.

- They assert that the notion of non-lethality is new, but tear gas and rubber bullets have been around for quite a few years now.

- They point out that a change of the profundity of the information revolution happens rarely in history. Why, then, do they believe they can predict the consequences of it.

Yet with so many diverse thoughts tumbling out at the reader at an extraordinary pace there are, of necessity, many true, or at least thought-provoking statements:

- They quote a retired naval officer, Larry Seaquist, "I've never found anyone to respond to my challenge to name three technologies which are under the exclusive control of the U.S. military. There's nothing left."

- "Our intellectual weapons for peacemaking are hopelessly out of date."

- There is the concept of demassification, which in an economic context describes the ability to manufacture exactly what and how many of something are required, rather than mass producing scads of one model ("any color so long as it is black".) In a military context demassification can be seen in the contrast between saturation bombing with B-52s and the use of terrain-guided cruise missiles. The benefits of demassification in the logistic tail are large in either the commercial or military case.

Demassification works in propaganda as well as manufacturing and the implications for a fragmented civilization within America are frightening. Our junk mail already is precisely targeted. Soon Americans will be seeing only the news that fits their current way of thinking. No longer will we have to look at an opposing view in the Washington Post or on network television to get our news, our targeted television will pander only to our present prejudices. This has implications for whom our future military personnel will be and how they and the rest of the nation will view the armed forces. It will become easier and easier for first wave intellects in a third wave future to (temporarily) ignore war, to maintain the "still widely held liberal idea that nobody really wants war...that deep down, adversaries are mirror images of ourselves...that governments are inherently adverse to risk...that the global system is really rational".

- The third wave requires educated operators. The military, say the Tofflers, lead the way in education. What they miss, I think, is that an uneducated soldier can shoot a Stinger missile, or that even a poorly trained submarine crew can sink ships with a smart wake-following torpedo. The education will go into the hardware and software; the people can remain ignorant.

  If, in fact, the third wave requires a highly educated populace, America is in trouble. We, internally, will continue to divide into mutually incompatible and intolerant camps, one of which contains the consumers of video games, and one of which includes those who have some inkling how the games are written. If conflict among waves is inevitable, it will not only occur along national lines, but within them as well.

- The concepts of disarmament and control of proliferation is based upon assumptions that already no longer obtain. Traditional diplomatic interactions with a nation are irrelevant when that nation is fragmenting.

Near the book's close the authors take on a subject that does not fit neatly into the three waves thesis: the spread of nuclear weapons. Abandoning their prismatic framework, the authors

present a chilling picture of nuclear weapons no longer the exclusive property of nations but of Mafia families, Branch Davidians, warlords, Serbian nationalists, and even individuals. Nuclear weapons in the hands of poor people frighten me. Throughout the fragments of the Soviet Union people are just coming to realize how poor they are. Certainly by now someone somewhere in what is left of that vast empire has let cash overcome conscience and sold a few weapons to somebody else with a grudge against the United States. My personal nightmare is not only of the dead of the first city to be murdered by a nuclear terrorist, but for the civil liberties of the rest of us when a threat is made to repeat the performance. Civilization, whatever wave, is only a thin veneer over the barbarian (zeroth wave?) and I don't think our Bill of Rights will stand in the face of a new, demassified, form of nuclear blackmail.

And finally, in the last three pages, they take on a concept I had been crying for throughout the first 250 pages: the notion of instability. Changes in the world culture do not necessarily lead to stable configurations, economically, socially, militarily. "Ethnic vendettas", they point out "can lead to ethnic battles that generate ethnic wars larger than a given region can contain". Many leaders (national, tribal, ethnic, religious,...)"are not risk adverse, but thrive on political risk. ...What many policy pundits still fail to appreciate is that when systems are "far from equilibrium" they behave in bizarre ways that violate the usual rules." The anti-warriors will have no way to predict the next catastrophe let alone recognize the symptoms that lead up to it.

The Tofflers point out the *myth of interdependence*, the fuzzy headed notion that nations which trade together stay together. England and Germany were each other's biggest trading partners in 1914. "Our decision makers, except in the most immediate sense, no longer really understand what they are doing." "Chance," they claim "will play a bigger role." Chance, I claim, has always played. The time constant for the response to government actions is and has been far too long for anyone to comprehend the true results of those actions. What *has* changed is that actions which used to have unpredictable domestic consequences now will have unknowable international consequences. The waves may come and go, but people aren't changing much. To use the Tofflers' metaphor: Congress is a first wave institution (the word *tribal* comes to mind). Bureaucracies are second wave; the media

is third wave. Not a one of them can predict the consequences of their actions.

With these sobering notions the book closes. There are no solutions. There are a few feeble notions like a call for the media to intrude, to *massify* where they are not demassifying. The Tofflers raise no plausible hope that the media can or will do so. They conclude: "We believe that the promise of the 21st century will swiftly evaporate if we continue using the intellectual weapons of yesterday." Given the reality of instability, it is hard to see how to prevent the evaporation even with intellectual weapons of tomorrow.

As I approached the book's end, I had a feeling of being saturated, over-stuffed. Do not, however, let that sensation deter you from reading the last two major sections. The whole book is well worth the investment of reading it, but it must be taken with care. Pay attention to the warning labels. When the authors suggest that some technical notion might seem incredible, it probably *isn't* credible.

The notion of matching anti-war approaches to war processes is profound (the engineer left in me is compelled to note that this is a case of matching impedances). Their recognition of changing and diverse warfare types is a valuable insight, and their three wave construct gives one a vocabulary with which to discuss it. Even so, they are too stuck upon their three wave theory of history. The view of everything reflected through the prism of three waves of civilization is both useful and irrelevant. The world is always more complicated than any metaphor we try to paste over it. It is a chaotic place, in the new mathematical sense that it is impossible to predict the consequences of our actions or inactions. **Nevertheless, the central theme of the book is worth taking on board: the ways we fight wars are changing more rapidly than the ways we make peace.** ■

WAR IN THE BOATS

by Captain William J. Ruhe, USN(Ret.)
Brassey's USA[1]
April 1994, 310 pages $22.95
ISBN 0-02-881084-8

Reviewed by
VADM Jon L. Boyes, USN(Ret.)

This is a unique book. It stresses the impact of submarine warfare on the men who manned the *boats* in World War II. Less emphasized were the results achieved in the submarine patrols described. As Tom Clancy notes in his Foreword, the book tells what it was like to fight in the boats in the *real war*, not what was done.

The book is the author's observations of the men who served with him on eight war patrols, in the three types of boats employed by the U.S. in WWII. The crews vary from the hardbitten, career, China Station men of the S-boats, to the college-type, *duration of the war* men of the newest fleet units; while their experiences in the war patrols described encompass almost every mission which U.S. submarines accomplished in the Pacific War. Thus the book, as Tom Clancy notes, presents a broad picture for today's reader of what the *war-thing* (the submarine war) was all about and creates an understanding of "our fathers and grandfathers as young men—who they were and what they did". (Hence, women may probably like this book as much as men.)

The format of the book is unlike that of other submarine accounts in that each chapter represents a single patrol which begins with leaving port and ends with the submarine's return at the end of the patrol. Matters which might influence what happens are introduced as flashbacks, while effects and results of the patrol are summarized. Thus the book has little extraneous detail and encompasses the *battle* that was fought in each individual war patrol. Like John Keegan's description of the battle of Agincourt in his book The Face of Battle, the submarine battles pictured involve: the nature of the men who fight the battles, the factors influencing the conduct of the battle, the strategy and

[1] Order from Macmillan Publishing (800) 323-7445.

tactics employed, and finally, how the battle with its accepted results is likely to live in history.

There's a lot of humor in this book, which only reflects the good, relaxed fun enjoyed by submariners while practicing their profession—even under adverse circumstances. The author finds tiny details, important since they lend an added appreciation of why a crew of all volunteers, with an attitude of *it can't happen to me*, think that *the best place to be in war* is *in the boats*.

Of particular interest are the contrasting styles of the five successful skippers represented in these eight patrols; as well as the conflicts between officers due to, in great part, the stresses created by their wartime activities.

The SubVets of WWII will rediscover why they count their war days as the best days of their lives. The submariners who have come along since can learn precious lessons of war which might be repeated as long as submarines continue to be viable instruments of national security. And all those who are submarine buffs can relish these *battles* because of their colorful descriptions. Additionally, it's a book that may easily become a military classic for future readers. ■

THE U-BOAT COMMANDER'S HANDBOOK

by The High Command of the German Navy
New Edition 1943
Thomas Publications
P.O. Box 3031
Gettysburg, PA 17325
ISBN 0-939631-21-0

Reviewed by
CAPT W.J. Ruhe, USN(Ret.)

Recalling that U-Boats sank 2,775 Allied ships of 14.5 million tons plus 175 warships in WWII, it is of great interest to read how it was done. Some of the principles and rules for submarine warfare seem to be German professional secrets. At least they were innovations to me, despite my considerable submarine war experience. Thus, Submarine League readers should find this book of great interest and very intriguing.

When this handbook was first issued in 1942 the average age of a U-Boat skipper was about 23 years and his submarine experience was little more than a year. The need for this book was great, to provide doctrine for getting best results in the German's anti-merchant ship campaign. By focussing only on sinking merchant ships, the handbook is clear-cut and unequivocal.

Sampling the wisdom in this book, we find under "Essential Characteristics of the Submarine": the strength of the submarine is its invisibility; its invisibility serves both as a means of attack, and as a means of protection; its seaworthiness is unlimited; the enemy thinks it is everywhere (its ubiquitousness); its power is greater than surface ships no matter how big—because the power of surface warships is applied in a different way; its low speed is its chief weakness; its vulnerability is great; but its weaknesses can be offset by clever tactics, unscrupulous use, and obstinate persistence—even when the chances of success seem slender; the commander of a submarine is entirely independent and free to make his own decisions; if a submarine is increased in size to make it multi-purpose, its fighting power as a merchant ship sinker is proportionately reduced; etc.

Let's also sample the handbook's instructions to U-Boat commanders for producing successful submarine operations: do not see danger everywhere; the precondition of success is surprise; he who wants to be victorious at sea must always attack; the successful tactician must be thoroughly familiar with his basic weapon, the torpedo; do not overestimate the enemy; difficult situations can be mastered if the commander acts cleverly and coolly, and the crew remains steadfast; when on the surface one should never see more of the enemy than the tops of his masts; because of possible oil leaks, the sub should not remain in the location of where it submerged; do not let the difficulties wear you down; better to destroy little than to damage much; etc.

There's lots more in specific chapters: the fundamental rules for making a submerged torpedo attack; the rules for a night surprise attack; how to deal with convoys; the various methods used for firing torpedoes; defensive actions when pursued by the enemy; the submarine for mine laying; the submarine as a gunnery vessel; how to counter enemy air activity; submarine communications; how to sink a steamer with high explosive cartridges.

Sinking ships using torpedoes can be expected in the future. So this handbook should keep alive the doctrines for what some

might consider to be a dying art—the art of submarining. You don't read this book, you study it to improve your performance with computer war games, and to understand how today's tactics for the use of nuclear submarines, employing a highly sophisticated torpedo or guided missile, can benefit from this historical document. ■

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[We routinely will publish short anecdotes of general interest to Members, as space and material permit. Members are encouraged to submit their anecdotes at any time; if not used in the ***SUBMARINE REVIEW****, they will be considered for use in the next issue of the NSL Fact and Sea Story Book.]*

Mistaken Identity

In early 1954, I was serving onboard USS SEA OWL (SS 405), having graduated from Sub School in December 1953. We were School Boat in the local New London Op-Areas, and I was the ship's OOD.

I turned the bridge over to the student OOD, and as I proceeded below he shouted, "Clear the bridge! Clear the bridge!" and hit the diving alarm as was expected of him. I bounded down the ladder into the Control Room and moved away from the diving stand so the student OOD/Diving Officer could assume the dive. I was still the ship's Diving Officer.

The senior Sub School rider was standing next to me inboard of the ladder. He looked at me and asked rather sharply if I were the Diving Officer. I answered "Yes, sir". His mental image of my face (from a couple of months ago) compelled him to say, "Well, get over there and take the dive!"

Just then, the student Diving Officer bounded down the ladder and started giving the expected orders: "All ahead two-thirds! Shut bow buoyancy vent!, etc."

Dick Boyle

Quick Recovery

We were conducting Barrier Operations in the vicinity of the GI-UK Gap aboard USS TUSK (SS 426) in the late 1950s. We had been tracking a possible fishing trawler on sonar for some time when the Conning Officer decided to proceed to periscope depth for a visual observation. He set *Condition Baker* in preparation for coming to periscope depth. This included, among other things, shutting the lower Conning Tower hatch (between the Conning Tower and the Control Room). Periscope observation revealed the fishing trawler was in fact a Soviet AGI, fairly close aboard. The Conning Officer passed the word over the 1MC

"Captain to the Conn, Captain to the Conn" which was the prescribed procedure for emergency situations requiring the Commanding Officer's presence in the Conning Tower.

The CO (now a retired flag officer) charged through the pitch dark Control Room, leaped for the ladder to ascend into the Conning Tower, and smartly smashed his head against the hatch which was shut in response to the setting of *Condition Baker*. The impact of the blow literally drove him back down onto his knees on the Control Room deck whereby, in his obviously confused state, he charged back up the ladder only to repeat his previous encounter with the closed hatch. As he picked himself up off the Control Room deck for the second time in about 10 seconds, he turned to the Diving Officer and with a slight smile on his face, calmly said, "Better open that hatch Mister before I batter it down."

LCDR Thomas L. Harold, USN(Ret.)

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