# THE SUBMARINE REVIEW

## JANUARY 1992


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## EDITOR'S COMMENTS

The most immediate issue facing the submarine community quite obviously concerns the future of the SEAWOLF program, with all that may mean for mid term force capabilities and industrial base concerns. **THE SUBMARINE REVIEW** is attempting to address that issue by highlighting the ongoing debate and by summarizing the latest actual developments. In this edition we have reprinted two recent articles which take on the positive arguments. In our In the News section, we have also emphasized the press reports of the budget process, the contract dispute, the hull cracks problem and the commentaries questioning the need for this program. It is quite clear that the subject of SEAWOLF series production beyond the currently authorized three ships is far from being settled.

Beyond the immediate SEAWOLF question, however, there is the issue of just what the Submarine Force is going to be all about in the coming years of the post-Cold War new world situation. In large measure, the set of Roundtable articles in the October issue of the **REVIEW** were about just that question. Several major points were developed in that discussion paper, and it is the intention here to bring to our readers substantive articles which support those claims of submarine utility for the future security needs of the nation through enhanced weapon and sensor capabilities, significant endurance and mobility and, most particularly, the stealth to complete a mission with sensitivity and minimum risk. Since most observers agree that the Gulf War pointed out that a new situation is facing the armed forces of the United States but that it did not definitively characterize that situation, it seems incumbent on us to present, in objective and clear terms, those capabilities of submarines which we feel can contribute in time of need so that all can see what can be gained from the maintenance of a strong Submarine Force.

To that end, there are several papers in this edition which directly address submarine capabilities in future conflicts. Dr. Dick Hoglund's Ace in the Hole is about the potential of the SSN and the Submarine-Launched Cruise Missile. Mine Counter Measures for the Submarine, by Dave Gorham and Wayland Comer, treats a subject that generated a fair amount of concern during and after the Gulf War and offers a solution

to the very real problem of the inshore minefield laid by a Third World power interested in keeping the U.S. Navy off his immediate doorstep. In addition, to the extent that communications are seen to be a problem in the effective integration of submarines in future conflict scenarios, RADM Jerry Holland has attempted to particularize the various concerns for greater understanding in his Command and Control of Submarines: A Misunderstood Model.

Because it also is proper both to seek to educate by looking at the lessons of the past, and to honor those who fought so well in the Second World War, **THE SUBMARINE REVIEW** will be publishing over the next several years submarine war patrol reports from the corresponding period fifty years ago. The first lesson, of course, is that it wasn't as easy then as it came to look in the history books. The November-December 1941 patrol of TRITON should tell us something about being on station when suddenly the world changed.

*Jim Hay*

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**1991 NSL MEMBERSHIP RECRUITING ALL STARS**

Our thanks and sincere appreciation go out to:

Individual Member: **RADM Jack Barrett** who brought in 6 new members in 1991.

NSL Chapter: **The Atlantic Southeast Chapter** (Bill Weisensee is President) brought 11 new members aboard!

Other Organizations: **U.S. Submarine Vets, Inc.** referred a total of 9 into our ranks.

Museums: **The Submarine Force Library and Museum** in Groton, which makes membership applications available to all those touring the Nautilus Museum, recruited a grand total of 15 new NSLers!

## FROM THE PRESIDENT

Coincident with the passing of the holiday season, the pace of life here at League headquarters begins its annual acceleration toward *Ahead Flank* (and, occasionally, on to *Panic*). There is little time for basking in the successes of the previous year. Rather, attention is focused on the rapid-fire planning and execution of the schedule for the new year, starting with the Corporate Benefactor Days in January, the Submarine Technology Symposium in May, the Annual League Symposium in June, and the many lesser events which dot the calendar, but play an important role in our mission to educate the general public about submarines. One such recent event, which represents the spirit, tradition, and professionalism of our corps, is especially worthy of report to you.

At the U.S. Naval Academy, the Dolphin Club promotes among the midshipmen an interest in submarines and submarine warfare. Each year the Club hosts a *Submarine Heroes* reception (with financial support from your League), providing an opportunity for the membership to meet and mingle with real heroes, those whose names appear in their naval history texts. This year in attendance were Rear Admiral Gene Fluckey (Congressional Medal of Honor), Rear Admirals Roy Benson, John Fyfe, and Joe Icenhower, and Captain Dulany Clagett (Navy Cross), and Rear Admirals Benitez, McNitt and Pugh and Captains Butler, Currie, Gillette, Mandel, Nash, Ruhe, Schratz, Schwab and Woodall (Silver Star). The midshipmen moved easily from one group of guests to another, with occasional glances at the wide-screen television on which the submarine clips from "Victory at Sea" were playing in continuous loop. An upbeat and inspiring address by Vice Admiral Roger Bacon, OP-02, on the state of the Force and the potential for a bright future in expanded roles and missions, some brief, but warm and typically humble words by Gene Fluckey on behalf of all of the *Heroes*, and an old-fashioned submarine sing-along led by our own Bill Ruhe made for a wonderful evening. I think we made some converts.

I had the honor and the pleasure of representing the Naval Submarine League at the ceremonies which marked the fiftieth anniversary of the 7 December attack on Pearl Harbor. As you all witnessed in the massive television coverage, the several

events were dramatic and emotional. An address by Secretary of the Navy Garrett at the ceremony honoring the submariners lost on the 52 boats "still on patrol" really captured the magnitude of their sacrifice.

In my speech at the Pacific Submarine Memorial, I noted that the Japanese did not consider the U.S. submarines to be a threat and thus did not allocate any weapons to the submarine base or to the boats moored there in upkeep. That tactical error came back to haunt them for those boats buttoned up, loaded out, and quickly engaged the enemy in the Western Pacific, ultimately turning the tide of war.

Life here in Washington for our submarine leadership (as it is for the entire defense establishment) has become a daily battle for survival. The diminishing threat posed by the Soviet Union as it breaks apart appears to have reduced the likelihood of global war, and consequently, the requirement for the U.S. to maintain the forces needed to respond immediately to a threat of that magnitude. We see, however, continuing dangers to national and world security. Throw in the loss of the stabilizing influence of a common adversary, and the proliferation of technologically advanced weaponry to Third World nations and you have the dilemma. The issue is how to maintain a military posture that presents a credible deterrent to what may evolve from the Soviet Union, while also protecting U.S. interests from a diversity of regional threats. The struggle to maintain a reasonable force level and to develop the *right* submarine for the future is at *fourth and one*, with some big decisions yet to be made. The League, as always, stands ready to help. Plan to join us at the June Symposium for the play-by-play.

***Bud Kauderer***

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## WHY SEAWOLF NOW?

*by Rear Admiral W. J. Holland, Jr., USN(Ret.)*

*[ED. Note: This article is reprinted with permission from the December issue of the U.S. Naval Institute Proceedings and is copyrighted© by the U.S. Naval Institute.]*

The accusations of *too big* and *too costly* against the SEAWOLF (SSN-21) bring a sense of *deja vu* to those who recall the same charges against the STURGEON (SSN-637) and LOS ANGELES (SSN-688). Controversy of this kind has been part of the U.S. Navy since its early days, when John Adam's superb frigates were replaced by Thomas Jefferson's useless gunboats.

Naysayers argue that there is no threat anymore. Senator Trent Lott (R-MS) characterized the SEAWOLF as "overdesigned for the post-Cold War posture." Those who want no new expenditures ask why a new submarine is needed, since the improved LOS ANGELES-class submarine is the best in the world. The program's large initial costs make it an easy target for those who seek to divert its funds to other uses.

Regardless of force sizes or identified threats, modernization must continue, going beyond the research-and-development stage. We must deploy and use equipment to find out how it works and to make proper plans for its follow-on generation. Just staying current requires continuing investment. The Navy must drive the areas of technology that affect maritime matters significantly -- especially when improved technology translates to large payoffs and others are not investing that way.

Undersea warfare fits this prescription precisely. Under the ocean, technological improvement continues to provide big payoffs. Submarines have not reached the point at which large expenditures achieve only small incremental gains in performance. Sustaining the industrial base is particularly important in nuclear matters. The miserable record of the public utilities, for example, underscores the need to sustain an environment of excellence and productivity in areas that are crucial to the Navy, in ways that others may not understand.

Technological improvements will continue to yield steep increases in submarine performance, but most of these will require a new hull. Electronics can be changed, but speed and

depth improvements can be made only in new designs. Magazine and launcher sizes are set forever in construction, as well.

Most important, quieting gains are made only in new construction. Stealth technologies cannot be retrofitted. In undersea warfare, quieting stands first in the order of merit; all other characteristics follow. There is no more important ingredient under the ocean than stealth, and those who predicted that submarines were as quiet as they could ever be were proved wrong in 1960, 1970, 1980, and again in 1990.

Those who suggest that a submarine can be built for less money, with capabilities that are *good enough*, have not learned from history. Every artificially constrained ship has been mediocre -- a second-rater unable to take its place in the line of battle. The Gulf War demonstrated the virtue of quality over mass. Iraq had thousands of T-72 tanks, which were destroyed without ever seeing their enemy. As a simile for submarine warfare, this is hauntingly accurate.

The most important reason to build new submarines is their overwhelming importance in maritime affairs. While hearing those who declare that military force will be unneeded in the new world order, one must keep in mind the West's incredible inability to predict Russian (formerly Soviet) behavior. No expert has foreseen by even one day any of the significant political events that have astonished the world for the past three years. Given this poor track record in anticipating Soviet Russian moves and the continued capability of their submarine force to threaten Western sea lines of communication, it is the height of folly to pretend that the United States will never need maritime military force again.

Overarching these professional considerations will be political facts that will overtake and overwhelm the military arguments. Ship construction will regain its public-works aspects. Through most of the Navy's history, ships have been built to maintain employment levels and to enhance local political prestige. Considerations of threat, technical merit, and potential missions have been and will be secondary. In this situation, shipbuilding monies will not be fungible. Those who envision shifting of funds from a SEAWOLF built in Virginia to three or four AVENGER minesweepers built in Wisconsin or four or five F-14s built on Long Island are dreaming.

Focusing exclusively on shipbuilding costs is the equivalent of a businessman's looking only at quarterly bottom lines. American business often is castigated justly for excessive concern over immediate profits. Naval officers should be careful to avoid the same trap over the SEAWOLF. Twenty-five years ago, naval aviation's leaders resolved to build large-deck carriers only. Even the persistent efforts of a Chief of Naval Operations committed to a small sea-control ship was unable to rock this resolve. Time has proved that large-deck judgement correct. As the size of the Navy diminishes, the value of each ship increases. By the year 2000, the Navy will have little use for second-raters in the line, be they carriers or submarines. Through continuing construction of the best ships that can be built -- albeit in small numbers -- we can preserve the industrial base and enhance the design skills necessary for rapid expansion of forces, should that be needed.

The march of technology is inexorable. The millennium of peace is not yet at hand. Soviet/Russian submarines are the only conventional arms that can seriously challenge the national interests of the United States. Even in the Third World, we cannot expect everyone to be as inept as the Argentineans in handling their submarines. Costs associated with system development have decreased only when new systems have been substantially less capable than the old. Expenditures for such systems are, in large measure, wasted.

Someday, the United States will have to build the SEAWOLF. If not now, when?

*[Admiral Holland is President, AFCEA Educational Foundation. He served in submarines and submarine-related assignments for 27 of his 32 years of commissioned service.]*

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## THE CASE FOR THE SSN-21

*by Vincent C. Thomas, Jr.*
*Contributing Editor, SeaPower*

*[Ed. Note: This article is reprinted with permission from the December issue of SeaPower, a Navy League publication.]*

***"If we are going to send submarine sailors to sea, I want them to be able to handle the toughest guy on the block, the toughest adversary they might have to face."***

Although the world now seems a much safer place, thanks to the collapse of the Soviet empire and the arms-reduction initiatives agreed to by U.S. President George Bush and Soviet President Mikhail Gorbachev, few Americans would disagree with that contention by Vice Admiral Roger Bacon, the Navy's Assistant Chief of Naval Operations for Undersea Warfare. But their commitment might be somewhat diluted when they learn that the submarines he believes will give the U.S. Navy the capability it needs for undersea supremacy -- for years to come -- would be the most expensive ones ever built. At a time when many members of Congress, and much of the media, favor cutting the budget for national defense, support for embarking on a major new shipbuilding program, no matter how badly the ships are needed, begins to wane. As a consequence, the Navy's SEAWOLF-class (SSN-21) nuclear-powered attack submarine program is in danger of being curtailed or even eliminated.

The decreased support for that program as well as the growing enthusiasm to cut the defense budget were manifested on Capitol Hill during debate earlier this year over the Pentagon's fiscal year 1992 funding plan by a motion to kill the SEAWOLF program and substitute funds for construction of two more LOS ANGELES-class (SSN-688) nuclear-powered attack submarines. Unquestionably, the 688's are superb ships. They may, in fact, be the best in the world—today. But their design is more than 25 years old, and they already have been upgraded and improved so often that there is now no room for further growth.

Soon, therefore, given the pace of development of Soviet conventional as well as nuclear submarines, the LA-class ships

may find themselves second best under the seas. But that fact -- and the fact that the cost of a new LOS ANGELES-class submarine today (two years after the last ship of the class was authorized) would be at least 85 percent of the vastly more capable SEAWOLF -- has not deterred those who want to slash the defense budget even more drastically than it already has been cut over the last several years.

**The Voice of Authority**

Bacon believes he is on solid ground, though, in supporting a 12-ship-minimum SEAWOLF program. His 30 years as a submariner attest to his expertise. He has served in both attack and ballistic missile submarines and has commanded both types. He also has commanded all U.S. and allied submarines in the Mediterranean and, while serving as Commander, Submarine Force, Atlantic, all submarines under the operational control of NATO's supreme allied commander, Atlantic. He has been responsible in recent years, Navy officials say, for the conduct of more, and more diverse, submarine operations, involving the submarines of more nations, than any other submariner in uniform today. He is not only academically familiar with the capabilities of U.S., allied, and Soviet submarines, he also logged underway time, as COMSUBLANT, aboard submarines of the French, Greek, Italian, Spanish, and Turkish navies. In short, he speaks with considerable authority.

Like other senior U.S. naval and military leaders, Bacon frequently points out that America must ensure that its naval forces can cope with the *capabilities* of potential adversaries, and not base its strategy on the alleged intentions of those potential adversaries (another way of saying the Soviet Union). Today, for Bacon as for other U.S. defense leaders, the watchword is and must be *uncertainty*. "The Soviets now have a force of 273 submarines. They apparently are in the process of reducing some of their older classes. But last year they built 10 submarines, including one for export. The Navy expects them to build at least six this year -- five already have been launched. In contrast, the U.S. Navy will commission only three submarines in 1991 and four in 1992; two of those seven are SSBNs (ballistic missile submarines). And the USN's total attack submarine force today numbers only 85 ships.

"We know," said Bacon, discussing the U.S. and Soviet

submarine building rates and the rationale behind the SEAWOLF program, "that as of now they (the Soviets) are poised to build quite a number more over the next five years, and that those they build will be modern, quiet submarines. The parity between our LOS ANGELES class and their ships is getting very close. Our margin of tactical superiority is there because of our people and our technology. Our people simply drive submarines better than anyone out there. But the technology and stealth which the Soviets have put into their ships are substantial, and we need SEAWOLF to expand that margin to ensure we maintain our undersea warfare superiority.

"People ask: 'But what are we going to use all our submarines for?' Again, there is that uncertainty. We have seen no changes in the operation of their strategic submarine force. They are at sea. Even under the proposals Gorbachev made in response to President Bush's nuclear-weapon-reduction initiative, we anticipate they will maintain a third of their strategic ballistic missiles at sea. And they tested those missiles during the August attempted coup, with two firings from the Pacific across the North Pole to their testing grounds. That force is out there. I simply don't believe that the American public would accept *not* being able to deter that force with some force in this country. And the ship that was designed to do that is SEAWOLF."

### A Handful of Havoc

Bacon also points out that fast, modern, quiet, diesel-propelled submarines are now to be found in ever-increasing numbers throughout the world. By the end of 1991, he estimates, there will be 39 countries (in addition to the United States and the Soviet Union) operating more than 400 submarines of various types, and that number is certain to increase as more Third World nations, anxious to build the offensive and defensive capabilities of their navies, acquire them.

Surprisingly, Iran, which now has no submarines, has trained some of its sailors to become submariners. Many defense analysts have speculated about how much leverage that oil-rich aspirant to world power could exert in the Middle East if it could create a small but formidable submarine force with easy access to the Arabian Sea and the Indian Ocean -- and to all the shipping lanes used by tankers carrying oil both east and west. Several also have asked how much havoc could have been

wreaked by just a handful of Iraqi submarines in the Atlantic and the Mediterranean during the buildup of U.S./coalition forces in the Middle East before Desert Storm. An estimated 90 percent of the equipment used during the war was moved by sea, and at the height of the buildup a heavily-laden merchant ship could be found every 50 miles from the U.S. East Coast to ports in Saudi Arabia.

But even if a consensus existed that there indeed should be *some* kind of successor to the LOS ANGELES-class SSNs, why SEAWOLF? Why go forward, some members of Congress have asked, with a class of ships the first of which will cost at least $2 billion, and whose successors will be almost as expensive? Why not make the best possible use of the older ships still available until a submarine less costly than the SEAWOLF can be designed and built? The Navy already has told Congress that it has initiated a study project to determine the feasibility of building a new class of nuclear attack submarines, so why not wait until the study in completed? The new submarine would be smaller, and lower in cost, than SEAWOLF, but also markedly less capable. It also is intended to *complement* the SEAWOLF, the Navy points out, not replace it. The first ship of the new class, moreover, could not be operational for another 13 years.

What many people do not realize, says Bacon, is that the **SEAWOLF represents the same kind of quantum leap forward in capability that was so dramatically demonstrated during Desert Storm, by the F-117 stealth fighter and the Tomahawk cruise missile.** *[Ed. Note: Emphasis added.]* Interestingly, the high development costs of both of those programs almost caused their cancellation. But they are now symbols of the high-tech weaponry that American industry can build, and that Americans *expect* to be built for the U.S. armed forces.

The SEAWOLF is of the same genre. It is designed to be 30 times quieter than the initial LOS ANGELES-class SSNs, says Bacon, and 10 times quieter than the improved versions of that submarine (the last 17 ships in the class). It will have a much greater operating volume and depth capability, 40 percent more weapons and combat capability, and the highest search rate of any submarine in the world.

The SEAWOLF's stealth and firepower, moreover, are complemented by a revolutionary new combat system, the BSY-

2, which will surpass by a wide margin, Bacon says, the capability of any other submarine combat system extant. The BSY-2 development effort, he says, has made steady progress. All *development-risk* hardware elements have successfully completed testing, and hardware and software integration is underway. In short, Bacon says, the BSY-2 defines the *next generation* for submarine combat systems.

### A Spectrum of Capabilities

And, asserts Bacon, the SEAWOLF will have the capabilities to conduct a broad spectrum of missions well into the next century, including shallow-water operational support for special operations forces. For years, critics of the SEAWOLF program have contended that the Navy's SSNs could not operate safely and effectively in shallow water. Smaller and ostensibly more maneuverable diesel boats are needed, the critics said, to support such operations -- which, most defense analysts agree, are the most likely conflict scenario of the future. In that context, Bacon cites the successes achieved in joint special forces operations in the Caribbean involving Army, Navy, and Marine Corps personnel, transported into position just 20 miles offshore from the area of operations and launched from two specially configured former Polaris SSBNs. The SEAWOLF, he claims, could carry out the same mission -- and do it better.

With its increased load of highly accurate land-attack missiles, Bacon continues, the SEAWOLF also can provide a conventional-deterrence capability against Third World nations. The outstanding success of the Tomahawk missile during Desert Storm has demonstrated the ability of submarines to influence events on land, he points out.

"SEAWOLF costs have risen because we are buying fewer units per year," says Bacon, addressing the SEAWOLF's alleged "cost problem." "It's as simple as that. Any businessman will tell you that, if you go from buying three units of a very specialized product per year to one, the cost per unit will rise."

In short, its advocates claim, the SEAWOLF -- even with its seemingly high price tag and certain construction problems that have developed (including brittle welds in the SSN-21 hull that must be replaced at the cost of a year in time and millions of dollars) -- will provide the clear technological edge that the U.S. Submarine Force of the future will need to maintain its

undersea superiority. In addition, because it will require fewer overhauls, the SEAWOLF will be able to spend more days at sea during its 30-year life than the 688s can. The result will be a 25 percent reduction in operating and support costs.

Because maintaining freedom of the seas is still the cornerstone of the U.S. defense policy, Bacon summarized, it makes sense to build the ships best able to attain that objective at the least risk to American lives.

**Then There Were Two**

What would happen if the defense budgetcutters prevail, the SEAWOLF building program is canceled, and a decision is made to wait until -- sometime after the turn of the century -- the design of the new SSN (Centurion is the study project name; the submarine's name will be determined later) is completed and approved and funds for its construction are budgeted? Will there be any shipyards left to build it?

That does not seem likely. Less than a quarter of a century ago there were six U.S. shipyards capable of building nuclear-powered submarines; the General Dynamics yards in Groton, Conn. (Electric Boat) and Quincy, Mass., the naval shipyards in Portsmouth, NH, and Mare Island, Calif., Newport News Shipbuilding in Newport News, VA, and Ingalls Shipbuilding in Pascagoula, Miss. *[Ed. Note: New York Shipbuilding yard in Camden, NJ also produced several SSNs.]* Now there are only two: Electric Boat and Newport News. Ingalls, the last of the other four yards to drop out of the submarine-building business, completed its last submarine in 1974. Moreover, Newport News is scheduled to deliver its last 688 in late 1995, does not yet have a contract to build a SEAWOLF-class ship, and has not built any of the 18-ship OHIO-class ballistic missile submarines. Electric Boat is scheduled to deliver its last LOS ANGELES-class ship in 1995, the SEAWOLF (name ship of the class) in 1996, and the Navy's last SSBN in 1997. That will leave only SSN-22 (funded in FY 1991) and SSN-23 (funded in FY 1992) on the Navy's orderbook.

But with only two submarines to be built, what happens to the thousands of skilled artisans who have been building the U.S. Navy's submarines for the last four decades? And what happens to the second- and third-echelon suppliers, and subcontractors that for years have been providing the systems

and subsystems and other building components to the primary contractors? Their numbers have been declining at an alarming rate for several years; according to one estimate, the number of U.S. defense suppliers dropped from 138,000 to 40,000 between 1982 and 1987. And in 1990, of 244 firms responding to a Defense Systems Management College survey, 21 percent said they either were cutting back on their defense business or getting out of the business entirely.

Bacon and other SEAWOLF supporters warn that, because the world remains unstable and the undersea warfare capabilities of other nations are still growing, the United States cannot afford to permit its ship construction capability to lie dormant for years -- and, then, in all probability, vanish.

Perhaps the most important factor in the current cost/capability equation, though, is simply this: If the United States is to protect its interests throughout the world -- and safeguard the lives of the young Americans who may be called upon to defend those interests -- it has a moral *responsibility* to provide the most effective and reliable weapons and ship and aircraft platforms needed for success in combat. The SEAWOLF clearly is one of those platforms and, in the opinion of Bacon and other supporters of the SSN-21 program, *the most cost-effective* of the undersea platform options now available. Its cost may be high in dollars, but those dollars would be buying the most desirable peace dividend of all -- peace itself. ■

# ACE IN THE HOLE

*by Richard F. Hoglund*

## INTRODUCTION

The dramatic success of power projection from sea and air platforms in Desert Storm -- coupled with expectations that similar power projection capabilities will be vital in future conflicts in our multipolar world -- have heightened the attention that military planners are giving to the strike mission. This article provides a perspective on the future role of submarine-launched cruise missiles in the power projection mission.

## WHY SUBMARINES?

When identical cruise missiles can be launched from surface ships, when manned aircraft strike missions are rising to the fore as the *raison d'etre* for aircraft carriers and when power projection in regional conflicts is becoming a fashionable justification for manned strategic bombers, it is reasonable to ask whether cruise missiles on submarines are really needed. The answer lies in the one thing that is clear about military conflicts of the future -- the uncertainty of their nature. Force structures need to be, above all, flexible so that they can be tailored to the political, geographical, scale and intensity realities of the situation. Each of the above-mentioned strike platforms has unique characteristics and advantages. The submarine's advantages accrue from its classic attributes of stealth, survivability, endurance, mobility and self-sufficiency.

The submarine's stealth and its consequent survivability provide a strike platform that can be poised in a firing location (at relatively short ranges if desired for minimal flight time) without indication or warning to the adversary. The strike planner gets to choose the timing and the launch location of the attack; there need be no warning whatsoever until the first cruise missile is in flight to its target. No other means of power projection provides the same degree of surprise. The uncertainty of launch location presents a complication to the defense because of the multitude of possible threat vectors. And, perhaps most importantly of all in future regional conflicts, **the poised submarine risks neither lives nor assets; it presents neither a provocation nor a target.** The latter factor should

become increasingly important as both modern diesel/AIP submarines and anti-ship missiles of improved range, accuracy and stealth proliferate, as they seem destined to do.

The submarine's mobility and readiness permit it to be deployed quickly to wherever it is needed. At the same time, the submarine's endurance and self-sufficiency permit it to remain poised for times measured in months, if necessary, without making a statement (unless one is needed) and without requiring a logistics chain. The subsurface strike threat can be played, if it is needed, or it can be held while diplomatic or other solutions are tried. Its very existence, whether deployed or not, is a deterrent to untoward actions. **The strike submarine truly is a national *ace in the hole.***

**WHY NOT JUST SUBMARINES?**

Given these attributes, shouldn't we consider putting all of our strike power on submarines? The one-word argument against this is -- cost. The combination of a modern nuclear submarine and a sophisticated cruise missile constitutes an expensive transportation system for the delivery of a thousand pounds of explosive. The submarine missile capacity does not lend itself to the kind of sustained pounding that was employed in Desert Storm. The submarine will have a limited salvo size unless it is configured to do little except to cart cruise missiles. (And I have argued in a previous SUBMARINE REVIEW article that the attack submarine of the future needs to have more multi-mission capability, not less.) As salvo size increases, the submarine may lose some of its stealth and survivability because of detectabilities of booster plumes and surface scars and the associated risks of lingering at datum. Additionally, while not a show-stopper, the $C^3$ problem is certainly complicated by having a submerged launch platform.

As stated earlier, the overarching need is for flexible, configurable force structures. Submarine-launched strike can be, will be and already is a crucial and important component of the overall strike forces, particularly for selective, precise and pre-emptive covert attacks. Such attacks on defensive forces can provide great leverage by reducing or eliminating attrition of subsequent air and/or surface forces. The niche of **covert strike** is filled uniquely by the cruise missile-armed submarine.

## TECHNOLOGY ADVANCES

One certainty of the future is that cruise missile technology advances will provide options for greater capabilities. Advances can be predicted with confidence in range, accuracy, stealth, terminal seekers and responsive targeting. These advances present both an opportunity and a challenge to the submarine force.

Increased range (a doubling or tripling of Tomahawk range is not unreasonable) is a two-edged sword. On the one hand, it permits the submarine to include a whole new menu of deep strike targets in its target set. But increased missile range also permits cruise missile-equipped surface ships to stand off to safe (or safer) ranges, opening up additional scenarios that may favor the cost-effectiveness of that alternative launch platform.

Likely to be the most significant technology advance is a related set of developments in new search sensors, real-time target detection and recognition techniques, mission management software and the computer density, power and architecture to put it all together. Applicable advanced sensor concepts include multi-element imaging infrared, polarimetric synthetic aperture radar, millimeter wave radar and laser radar. The sum of these advances means that the cruise missile of the future will be capable of attacking fixed or relocatable targets in all weather, and to retarget in a matter of minutes without a need to rely on terrain matching and optical target scene correlation. These advances will open up a new sphere of applications and scenarios.

Participation to the fullest extent in this expanded role for cruise missiles will require a new level of interaction and coordination of the submarine with theater and battle group command, control and intelligence systems. Strike operations are likely to be joint in nature and centrally controlled. A near real-time targeting capability is only useful if the submarine receives near real-time target information, i.e., timely communicated intelligence. The submarine component of the overall strike force will be just that -- one component of an integrated strike system. *Lone wolf* submariners need not apply.

## SUMMARY

We are at the threshold of an era of heightened importance for the strike warfare mission. Cruise missile equipped subma-

rines have a clear, unique and important role to play in expected future conflicts. Advances in cruise missile technology will offer opportunities to expand that role; the submarine force must seize them if it is to participate fully. With cruise missile submarines offering a high impact, low risk strike option, future presidents are likely to ask "where are the submarines?"

*[Acknowledgement: The author wishes to acknowledge particularly helpful discussions with Dr. James R. Brooke of General Dynamics Convair Division and Admiral R. L. J. Long, USN(Ret.).]*

*[Note: The opinions expressed herein are solely those of the author and do not represent positions of General Dynamics Corporation.]*

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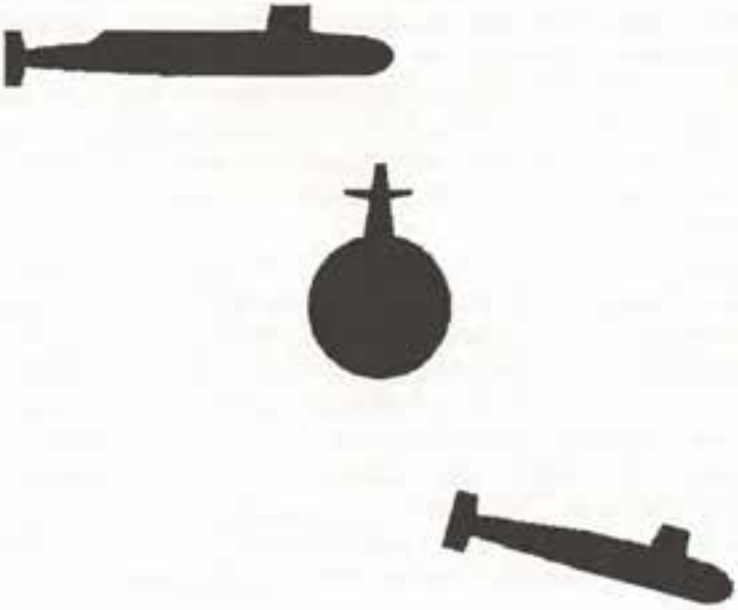

# MINE COUNTERMEASURES FOR THE ATTACK SUBMARINE

**Thesis:** The UUV will play a future role in Submarine MCM

*by David S. Gorham and Wayland S. Comer*

**The nature of U.S. Naval Submarine Warfare has changed.** In two global conflicts, the effective use of the attack submarine has proven its influence on naval warfare. Since the advent of the nuclear attack submarine, there have emerged certain traditional roles for these platforms, as summarized in Table 1. However, the capabilities required by the submarine force are not solely determined by these missions. Recently, mined shallow coastal waters were encountered in the Persian Gulf, in the only live engagement involving U.S. submarine forces since World War II. The ability to penetrate mined coastal waters is uniquely different from those capabilities required to counter the threat historically presented by the Soviet block. It has been shown in the Persian Gulf that submarine operations, in order to support all types of naval warfare, must also consider the mine threat in shallow coastal waters. Such waters are likely future sites of limited intensity regional conflicts.

1) Strategic Containment / Bastion Warfare
2) Forward Presence and Force Projection
3) Maintaining Sea Lines of Communication (SLOCs)
4) Anti-Submarine Warfare (ASW)
5) Anti-Surface Warfare (ASUW)
6) Battle Group Defense
7) Amphibious Assault Operations Assistance
8) Covert Insertion and Recovery
9) Support of Special Operations
10) Oceanographic Data Collection

**Table 1.** Fast Attack Submarine roles that evolved during WWII and subsequent.

As the U.S. and whatever new federation comes from the Soviet Union struggle to create an alliance to maintain and control regional conflicts; release of previously constrained tensions will become increasingly more frequent. The proliferation of inexpensive and increasingly sophisticated weapons can only serve to increase the probability of these conflicts.

It is likely that the evolving Third World naval warfare strategy will continue to consider mine warfare a cost effective deterrent to potentially hostile naval forces. Mines are an inexpensive means of near shore, shallow water defense or area denial. They require no special platform for deployment and lend themselves to deployment from any craft of opportunity that might be readily available. This approach to mine warfare contrasts sharply with the specialized platforms developed to locate and neutralize them. Increasingly sophisticated mines are readily available on the international arms market, yet even the unsophisticated mine can take warships out of service, as experienced by the USS TRIPOLI in the Persian Gulf.

**Attack submarine independent operations and minefield penetration.** The independently operating attack submarine is a powerful force capable of supporting all types of naval warfare. It is imperative that the covert, independent nature of attack submarine operations is maintained, even in a mine riddled theater of operations. Deployed submarine forces must be able to penetrate regions defended by, or potentially defended by mines. The submarine will require a combination of onboard and offboard sensors that can probe the field. The system must find any mines that are present, accurately figure out their location, classify them, and provide the means for penetration of the minefield or assist the submarine to maneuver around it. If the submarine is to maintain its independent role, the sensors and sensor data must be an integral part of the submarine warfare suite. The sensors must provide real-time tactical data that gives the commanding officer the assurance that he can safely continue the mission.

**The required sensors, data processing, and supporting system are under development.** DARPA (Defense Advanced Research Projects Agency), the Naval Laboratories, and industry are continuing the research and development efforts to

provide the submarine force a minefield penetration capability. Analytical studies have proven the feasibility of a remotely controlled sensor platform for guiding a submarine through a minefield. Proof-of-principle demonstrations have been conducted, using an ROV (Remotely Operated Vehicle) operated from a host platform. DARPA is now nearing completion of an autonomous Unmanned Undersea Vehicle (UUV) prototype program, the Mine Search System (MSS), that will further prove the feasibility of leading a surface ship through a minefield with a tethered UUV sensor platform. A torpedo sized UUV system for application with attack submarines is a logical follow-on effort to MSS, once successful demonstration and validation is complete.

Communicating the position of mines to the host platform is a critical capability. The communications system developed for the MSS prototype will demonstrate a high data rate fiber optic tether for vehicle command, control, and data exchange. The tether is planned for use during the escort phase of the demonstration. The MSS vehicle was also designed to autonomously survey, accurately map, and transmit to the surface ship, the location of mine-like objects via an acoustic telemetry link. For the future, more advanced high data rate acoustic communications, and blue-green laser communications for long range, high data rate communications are also being researched.

Development is continuing on integrated precision navigation systems that can provide accurate, long-range, way-point navigation, with the precision necessary for work-station location and area minefield mapping. Integration of state of the art Doppler sonars or Correlation Velocity Logs is underway that will provide velocity vector data, critical to advanced navigation system precision. These modern navigation systems incorporate use of the Global Positioning System (GPS) for periodic position verification. Systems are being researched that will accurately find position relative to acoustic transponders or mapped bathymetric features.

Additional DARPA programs are in place to develop other key technologies needed to support this mission and other UUV missions under evaluation. Software and supporting hardware are in development that can monitor the offboard sensor system and recognize unanticipated mission events. The system will be capable of autonomously assessing mission impact, directing

corrective action, and replanning or aborting the mission. This effort, appropriately termed Autonomous Control Logic, completed the first phase in 1990 and commenced a 48 month Phase II effort in mid 1991. Integration into a UUV and demonstration at sea is planned for Phase III, around the middle of the decade..

Energy systems are considered to be on the critical path for these UUV systems. Therefore, one of DARPA's key technology thrusts is the development of high energy density systems. DARPA's goal is to increase specific energy density by a factor of 2, to possibly a factor of 10, over existing silver-zinc battery systems. This development effort will span the next several years. Presently, liquid oxygen and hydrogen are to be used as oxidant and fuel for a Proton Exchange Membrane (PEM) fuel cell. Similarly, liquid oxygen is used in a parallel development of an Aluminum-oxygen semi-cell. Development of alternative methods of storage may be necessary if the submarine community judges cryogenic storage of fuel and oxidants to be unsatisfactory. An aluminum silver-oxide primary battery is also under investigation by the Naval Undersea Systems Center, funded by the Office of Naval Technology.

Increased emphasis is applied to reducing the integrated vehicle system acoustic and non-acoustic signatures as the systems evolve. Non-magnetic materials, acoustically quiet motors and thrusters, and use of anechoic materials are just some technologies under investigation. These technologies will potentially enhance the covert operational capabilities and reduce the likelihood of unintentionally detonating a mine with the UUV platform.

While some critical technical challenges to providing a minefield penetration capability have been addressed, several challenges remain. For instance, UUV launch and recovery from a moving submarine will probably be required. If the system is to be recovered, conditions will likely mandate a dry maintenance capability, with minimum impact upon submarine combat readiness. In existing SSN configurations, launch and recovery through a torpedo tube become the most logical solution. Launch is perhaps easier than recovery, since the UUV can be designed to be impulsed or to propel itself out of the torpedo tube. Vehicle control, capture, and safe recovery, while minimizing impact on both the torpedo tube and vehicle

is an imposing challenge. If a tethered system is used, then joint host-tether-sensor platform control while underway, compounds launch and recovery problems. Lateral launch systems and alternative shelters are under study and appear to have significant design challenges. Industry and U.S. Navy resources are pressing forward with proof of principle demonstrations as prototype systems are evolving.

As the large DARPA prototype vehicle systems progress, miniaturized components and subsystems are in development for the next generation torpedo tube sized vehicles to follow. Control and data interface display consoles along with the vehicles and their payloads must be packaged to minimize the impact to onboard maintenance. Servicing must not adversely affect submarine combat readiness or affect crew or submarine safety. Integration of vehicles and payloads into modular future submarine designs may be essential to an effective solution to providing these capabilities.

**Closing on the solution.** Even with the technical issues identified and many achievable solutions on the horizon, enabling future submarines to penetrate a minefield effectively is not a trivial task. Several more years of development work are required to field systems that will meet mission needs. Funding ceilings presently constrain current efforts. Continued industry and government support is essential. Minefield detection and penetration is a multi-mission capability that supports many naval warfare communities. Not limited to exclusive use as an SSN adjunct, similar systems can be deployed from surface ships and aircraft.

Offboard sensor systems will extend the battle space of the host platform, assist in achieving mission objectives, and improve weapon system performance. **The offboard sensor system will accept the platform risk when the host can not or should not.** These systems need to be developed as adjuncts to existing combatant platforms and avoid the perception of being an offsetting force, competing for limited capital resources in an increasingly sensitive political arena.

The role of the submarine force will not be replaced by unmanned platforms. Instead, the additional capability will reinforce the utility of the existing and future submarine force. Government and industry should both recognize the need for an affordable force adjunct that enhances submarine effectiveness.

The attack submarine must remain effective in all areas of naval warfare, including shallow coastal water regional conflicts. Mission effectiveness may very well hinge upon the ability to independently enter a mine denied combat theater. The integrated offboard sensor system for minefield penetration is an achievable solution now in development for the attack submarine.

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## NSL SYMPOSIUM 1992

When: June 10 & 11
Where: Radisson Mark Plaza Hotel
Alexandria, Virginia

Agenda:

**10th (Starts at 1 p.m.)**

- Interesting and informative Navy and Civilian Speakers
- Business Meeting
- Happy Hour, Singalong, Piggy-back Reunions

**11th (Starts at 8 a.m.)**

- Introduction by OP-02
- OP-02/Type Commanders Open Forum,
- Speakers representing Navy, Industry and Congress
- Fleet Award Ceremony
- Featured Luncheon Speaker
- Banquet, Guest of Honor Address

Details: Flyers will be mailed to all hands in February.

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# FUZZY LOGIC: THE COMMANDER'S SECRET WEAPON

*by Marc C. Leonetti*
*Computer Scientist*
*Computer Sciences Corporation*

There has been a recent surge of interest in fuzzy logic and its application to complex systems engineering. While the concept of fuzzy logic has been a subject of research for about 25 years, only recently has this concept gained wider acceptance. Fuzzy logic was developed to allow computers to operate more like humans when dealing with ambiguous concepts. In fuzzy systems, a variable can take on any value between 0 and 1 inclusively, whereas in binary systems these variables can only take on the values of 0 and 1. Therefore using fuzzy logic allows multilevel conditional decisions, and fuzzy algebra to replace binary decisions and boolean algebra in digital systems.

Some specific complex problems in the undersea arena can be made more tractable by use of fuzzy techniques. These problems can be characterized as complex decision problems based on incomplete or uncertain input. This class of problems has frequently been discussed in the fuzzy literature, most particularly by W. J. M. Kickert in Fuzzy Theories on Decision Making: A critical Review, published by Martinus Nijhoff, Leiden, Netherlands, 1978. These problems are also typical of those faced every day by the modern submarine commander.

The essence of the **sensor fusion problem** is to select a decision from uncertain information from several sensors. The different sensors may consist of sonar arrays, radar arrays, radio frequency arrays, and perhaps vision and thermal sensors. By modeling individual sensors as probabilistic forecasters, and by fusing the probabilities of detection from each of these sources in a central processor, using some fusion rule, it has been shown by R. Krzysztofowicz, in Fusion of Detection Probabilities and Comparison of Multisensor Systems, in the IEEE Transactions on Systems, Man, and Cybernetics, Vol. 20, No.3, of May/June 1990, that a more accurate detection decision can be made. An example of this situation is presented in the following table.

Table 1. Detectability Data Table

Detectability
Signal Excess

| Sensor i | Value Si | Truth Value Xi | Fusion Rule H |
|---|---|---|---|
| Sonar Array 1 | 12 dB | 1.00 | |
| Sonar Array 1 | 9 dB | .75 | |
| (1) Sonar Array 1 | 6 dB | .50 | .5 |
| Sonar Array 1 | 3 dB | .25 | |
| Sonar Array 1 | 0 dB | 0.00 | |
| Sonar Array 2 | 12 dB | 1.00 | |
| Sonar Array 2 | 9 dB | 1.00 | |
| (2) Sonar Array 2 | 6 dB | .50 | .5 |
| Sonar Array 2 | 3 dB | 0.00 | |
| Sonar Array 2 | 0 dB | 0.00 | |
| Radar Array 1 | 12 dB | 1.00 | |
| Radar Array 1 | 9 dB | .75 | |
| Radar Array 1 | 6 dB | .50 | |
| (3) Radar Array 1 | 3 dB | .25 | |
| Radar Array 1 | 0 dB | .12 | .8 |
| Radar Array 1 | -3 dB | .06 | |
| Radar Array 1 | -6 dB | .03 | |
| Radar Array 1 | -9 dB | .01 | |
| Radar Array 1 | -12 dB | 0.00 | |
| Visual | Clear | 1.00 | |
| Visual | Dim | .50 | .8 |
| (4) Visual | Murky | .25 | |
| Visual | Blind | 0.00 | |

Using likely values of multisensor sensitivities and their relative reliability, suppose:

Sensor (1) Sonar 1 reads 3dB or .25
Sensor (2) Sonar 2 reads 3dB or .00
Sensor (3) Radar 1 reads 3dB or .25
Sensor (4) Visual reads Murky or .25

Using the standard rule for detection, (i.e., that the truth value of the sensor > 0.5 for a detection), then the readings from the 4 independent sensors individually do not admit a detection. But in a multisensor system, with the appropriate fusion rule, these values can be sufficient for a detection.

Here the System Truth Value, T = (X1*H1)+.....+ (Xn*Hn)
In the example given:

$T = 0.5\ (.25) + 0.5(0) + 0.8\ (.25) + 0.8\ (.25)$

$T = .525 > .5$

So there is a contact present to the system. This example shows that although the individual sensors cannot make the detection decision because the probability of detection of each sensor is too low, a decision can be made in a multisensor system with probability fusion, using an appropriate fusion rule. This fusion rule could be contained in the wisdom and experience of a senior decision maker who assesses the reliability of his sensor systems and acts on his feelings, or it can be built into an integrated system as an explicit method of combining multi-sensor inputs.

The **problem of acoustic modeling** is to develop an accurate acoustic model for a given environment. Propagation loss models are typically created from an uncertain knowledge of the acoustic environment in the proximity of the platform and an uncertain knowledge of how the acoustic environment will evolve in time and space. The nearby acoustic environment may be represented in several ways. First, direct measurements of the parameters which affect the acoustic environment (e.g. temperature, salinity, depth) might be made in real-time. Second, historic measurements of these parameters might be used. When conditions and resources allow, real-time measurements are made in the vicinity of the platform and a sound velocity profile (SVP), based on these measurements, is generated. Ocean surface and bottom conditions may be evaluated in real-time, or looked up. If timely measurements are impractical, historic sound velocity profiles as well as historic surface and bottom conditions, are used to generate the propagation loss. In an ideal propagation loss calculation, the temperature, salinity, depth, and surface and bottom conditions in the vicinity of the platform out to the greatest range of interest in all directions must be taken into account to gain an accurate directional representation of the propagation loss. Finally, an estimation of propagation loss based on the platform's depth is generated from these conditions.

Fuzzy logic has an application to the problem of modeling the acoustic environment. First, by attaching a relative weight to the reliability of real-time and historical measurement, a

propagation loss curve generated by a combination of data can be made to favor the measured values. When entirely historic data have been used, a confidence weighting can be associated to create a propagation loss model which more closely reflects reliability of the input. Second, fuzzy logic could be employed to weight the spatial and temporal fluctuations of the SVP. This weighting could have as its basis a correlation with real-time surface conditions and atmospheric data. A number, perhaps the proportional to the variance of the SVP data, could be associated with each SVP data set. When combining data sets, variances could also be combined using some fusion rule to obtain a more realistic propagation loss representation.

The real and historic data could be combined using a fusion rule such that:

1. If a current SVP exists it will be used exclusively.
2. If stale SVPs exist, weigh them with historic values.
3. If only historic values exist, they will be used exclusively, but they will be weighted by reliability.

This idea can be extended to the more complex case of a spatially or temporally varying SVP. In this case, the SVP data sets may have been generated by various sources at different times. Accounting for the reliability of the SVP should yield a more precise propagation loss model. A realistic estimate of the propagation loss could serve as the basis for a determination of the likely ranges of detection.

The **contact localization problem** is another instance of the sensor fusion problem. The essence of this problem is to optimize the location of a detected contact using a finite number of uncertain or incomplete position measurements. In underwater acoustics this is a particularly important problem. An accurate geographic picture of all contacts and potential contacts is essential. However, in many cases, contacts also have the goal of remaining undetected, which leads to difficulty in localizing contacts once they have been detected. With the intricacies involved in performing contact localization, primarily on acoustic data in a nonisotropic acoustic medium like the ocean, this problem becomes very significant. Here, fuzzy logic could help. By attaching weights to the reliability of sensor outputs, summing the results, and using a reasonable fusion rule, an improved contact localization can be achieved. Again this is something that a senior officer will do instinctively, but

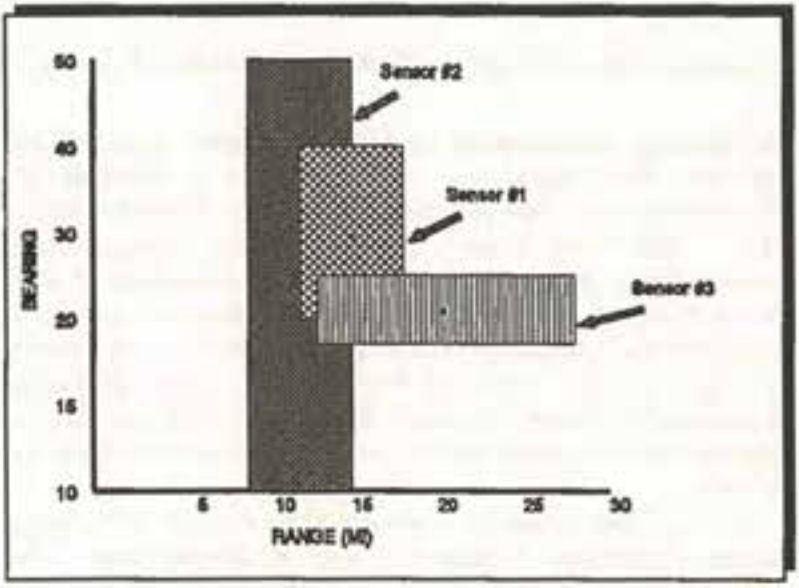
this ability can be modelled mathematically and built into an integrated system.

Consider the following example which portrays 3 sonar systems and their accuracy in 3 situations:

Table 2. Contact Localization Data Table

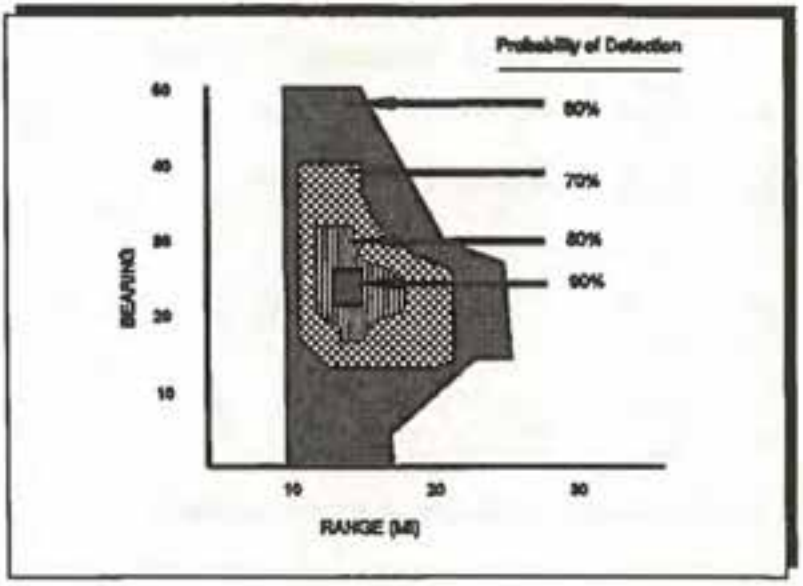
| Sensor i | Fuzzy Position Si | Range/Bearing Si | Variance QSi | Prob. Xi | Fusion Rule |
|---|---|---|---|---|---|
| Sonar 1 | Nearby | 5 NM, 30 Deg | .5 NM, 2 Deg | .9 | |
| Sonar 1 | Far | 15 NM, 30 Deg | 3 NM, 10 Deg | .5 | .8 |
| Sonar 1 | Very Far | 50 NM, 30 Deg | 10 NM, 20 Deg | .3 | |
| Sonar 2 | Nearby | 4 NM, 10 Deg | .5 NM, 20 Deg | .9 | |
| Sonar 2 | Far | 12 NM, 20 Deg | 3 NM, 30 Deg | .5 | .3 |
| Sonar 2 | Very Far | 42 NM, 5 Deg | 10 NM, 90 Deg | .1 | |
| Sonar 3 | Nearby | 6 NM, 27 Deg | 2 NM, 1 Deg | .9 | |
| Sonar 3 | Far | 20 NM, 22 Deg | 7 NM, 3 Deg | .5 | .5 |
| Sonar 3 | Very Far | 57 NM, 41 Deg | 25 NM, 6 Deg | .2 | |

A graphic depiction of the Far situation looks like:




Graphic Depiction of the Far Situation

By combining these sensor outputs with a suitable fusion rule, a topographic map of regions of constant probability of location can be drawn. This map might look something like:




Topographic Map of Regions of Constant Probability of Detection

The **contact classification problem** is another sensor fusion problem. The essence of this problem is to optimize the classification of a detected contact by using uncertain sensor data. One wants to ascertain not only the location of all contacts and potential contacts, but also an indication of what threat, if any, these contacts pose. By classifying a contact and using previously acquired knowledge about that class of contact, one can use this enhanced knowledge to make intelligent operational decisions. By using techniques to fuse the knowledge of various sensors, an improved classification decision can be made.

For example, a contact is known to be located with a great degree of certainty 5 miles due east of the platform. Two sensors indicate that the contact is a hostile warship based on partial acoustic signatures, another sensor indicates that the contact is a friendly warship based on a partial acoustic signature, and a fourth sensor suggests that the contact is a neutral

merchant ship based on an ambiguous visual contact. One can fuse this data to make a structured classification decision.

Consider the following table:

Table 3. Contact Classification Data Table

| Sensor i | Fuzzy Classification Si | Truth Value Xi | Fusion Rule H |
|---|---|---|---|
| Sonar 1 | Hostile Warship | .7 | .5 |
| Sonar 2 | Hostile Warship | .3 | .2 |
| Sonar 3 | Friendly Warship | .7 | .7 |
| Visual | Neutral Merchant | .5 | .8 |

Here, the probability that the contact is a Hostile Warship is (HW). Then, HW = .7*(.5) + .3*(.2) = .41.
The probability that the contact is a Friendly Warship is (FW). Then, FW = .7*(.7) = .49
and the probability that the contact is a Neutral Merchant is (NM). Therefore, NM = .5*(.8) = .40.

The result of sensor fusion, based on the fusion of probabilities of several sensors, is that the contact is more likely a Friendly Warship than a Hostile Warship because of the quality of the sensor input that indicated a Friendly Warship classification. This quality is a reflection of the reliability of the sensor. In current systems, this assessment of the sensor quality comes directly from the experience of the commander or his surrogate, who has likely made reliability assessments of his sensor assets for years. In future systems, these assessments may be computer generated.

It is obvious from the previous discussions that the selection of an appropriate **fusion rule** is very important in the construction of any multisensor system. This fusion rule, whether it is formulated though extensive simulation and explicitly incorporated into a combat system, is the key to accurate decision making. Current systems must rely solely on the experience of the decision maker which may not be flexible enough to incorporate the rapid changes which characterize the modern

underwater acoustic environment. A system which is designed to allow real-time creation or modification of the fusion rules would be a powerful system, because it could adapt to deviations in sensor reliability which may result from environmental, hardware, or operator changes. The fusion rule could be constructed to vary with time to allow for known or suspected degradation of hardware or operator reliability. A fuzzy integrated system could present a fused decision result to the senior decision maker. He may still go with his instincts, but he will have at his disposal a more accurate situational assessment upon which to base his decision.

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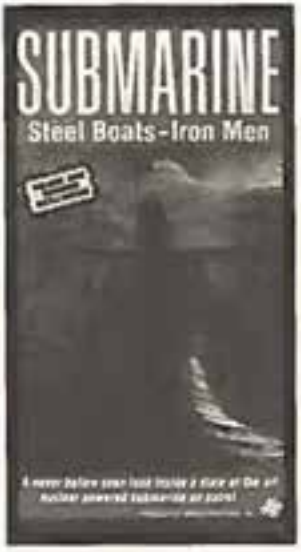
## SUBMARINE: Steel Boats, Iron Men




The NSL is pleased to offer its members VHS copies of **Submarine: Steel Boats, Iron Men** at a special price. The sixty minute film, produced by Varied Directions, Inc. with the assistance of the NSL, gives the public its first look inside a nuclear submarine in twenty years. A film team caught the Commanding Officer and crew of the USS HYMAN G. RICKOVER in action. Also included are interviews with some of the most honored submarine commanders, and an overview of the development and strategic use of the submarine in both world wars.

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# THE BRITISH SUBMARINE FLEET: 1992 AND BEYOND

*by David Miller*

Like the other Western powers that saw the Cold War through to its highly successful conclusion, Britain is now reassessing its future force requirements. This far-reaching process is affecting every element of all three Services -- the Royal Navy's Submarine service as much as any.

During the period of the Cold War the Submarine Service evolved into a force of three elements, all under the functional command of Flag Officer Submarines (FOSM), based at Headquarters Commander-in-Chief Fleet (CINCFLEET) at Northwood, near London. The most important single element of the submarine flotilla was the Polaris force of four RESOLUTION class SSBNs. These were the outcome of the Kennedy-MacMillan talks in Nassau in 1962, in which the President agreed to provide Polaris A3 missiles for installation in British-built submarines. Commissioned between 1967 and 1969 the four boats took over sole responsibility for Britain's independent strategic deterrent from the Royal Air Force.

The second element was a force of SSNs. Since the commissioning of the first British SSN, DREADNOUGHT, in 1963, a regular programme resulted in continuous production. In general terms, a new class of 5-7 boats joined the fleet in each decade and by 1990, with DREADNOUGHT stricken, there were eighteen boats in service. The third element was a small number of SSKs, all of which had been completed in the 1960s.

## THE CURRENT SUBMARINE FLEET

### SSBNs

The four current SSBNs displace 8,500 tons submerged and are generally similar to the U.S. Navy's LAFAYETTE class. They have been regularly refitted and modernised, but are now approaching the end of their service lives and there have been recent press reports of reactor problems in certain boats.

These SSBNs have been armed throughout their service by U.S.-supplied Polaris A3 SLBMs. These were rebuilt and re-motored by Lockheed in the 1980s and the original British-built warheads were also replaced between 1982 and 1988. The new warheads (code-named Chevaline), are described by Norman Friedman in World Naval Weapons Systems, (USNI, 1991), as

a "compromise between the multiple, but co-targeted warheads of U.S. Polaris systems and the fully-independently targeted warheads of Poseidon;" i.e., a cross between MRV and MIRV. Officially designated Polaris A3TK, each missile carries six 150KT Chevaline warheads.

Over the years there has been some vociferous and widely reported, domestic political agitation to get rid of the nuclear deterrent. This view was, in reality, confined to some fringe elements of British society, and the maintenance of the SSBN force was never in serious doubt. Thus, when the question of replacing the RESOLUTION class was addressed in the 1970s, the question was not one of principle, but rather of the most cost-effective way of achieving it.

Initially the government announced (1980) that it would purchase Trident I (C-4) SLBMs for a new class of SSBNs, to be commissioned during the 1990s. In 1982, however, it was decided that it would be more sensible to purchase Trident II (D-5). Firm orders were then placed for the boats; #1 in 1986, #2 in 1987 and #3 in 1990. The fourth has still not been ordered, although the Minister for Defence Procurement announced on 1 July 1991 that the government "stood by its intention" to place such an order.

The new submarines will be much larger than their predecessors, displacing some 15,000 tons submerged. They will each carry sixteen Trident II (D-5) missiles, but, as with the Polaris, these will carry an entirely British front-end, consisting of 150KT MIRVed warheads and decoys/penaids. It has also been publicly stated by the Ministry of Defence, that, although the missiles are capable of carrying up to twelve warheads, the British will never mount more than eight. The first-of-class, VANGUARD, will be launched in February 1992 and commissioned later in the year, followed by the others in 1994, 1995 and 1997, respectively.

**SSKs**

The first British, new-build, post-war submarines were eight PORPOISE class boats, launched in 1956-59, which were quickly followed by thirteen of the very similar OBERON class. Fourteen OBERONs were also exported to Australia (6), Brazil (3), Canada (3) and Chile (2). The Royal Navy's OBERONs have served well, with no losses, and several took part in both

the Falklands and Gulf wars, although their role has been shrouded in secrecy.

The PORPOISE class was discarded between 1976 and 1987 after a relatively short operational life. The OBERONs have served longer and five underwent a major modification programme in the early 1980s, and may remain in service for a few more years. Others of the class are being stricken at a slow rate, with the last due to strike in 1994. Egypt has already purchased one of the PORPOISE class boats and the first of the OBERONs to be offered for sale, and has expressed a desire to buy six more as they become available.

There was a long debate throughout the 1970s about the value of building a successor to the OBERONs and the RN considered an all-nuclear submarine force, as exists in the United States Navy. It was eventually decided, however, that diesel-electric submarines continue to have substantial advantages in some operational areas and are also much cheaper. The UPHOLDER class boats, for example, are reported to cost some £150-200 million (U.S. $262.6 - 350 million) to build compared with about £300 million (U.S. $525.5 million) for a TRAFALGAR class SSN, while the life-cycle cost of an SSN is reported by Jane's Defense Weekly (April 27, 1991) to be some three times that of an SSK. Another important consideration is that SSKs require much smaller crews (although they are, admittedly, smaller boats): UPHOLDER, for example, has a crew of 7 officers and 37 enlisted men compared to 12 officers and 97 enlisted men for TRAFALGAR.

These cost factors, coupled with the excellent operational performance of the SSKs, led to the new UPHOLDER class being ordered in 1983. The design was based on that of the Vickers Type 2400, which was being marketed at that time by Vickers Shipbuilding to foreign navies.

The class has not been without its problems, which have included time delays, cost overruns and design faults. The delays on entry to service have been considerable; #1 was 3 years late and #2 18 months late, while #3 and #4 are estimated to be 6 and 3 months behind schedule, respectively. Part of the initial delay was due to a power-loss problem, and later a design fault was found in the torpedo doors, which requires the first three to be docked for rectification, although the fourth will be modified during construction.

SSNs

The VALIANT class comprises five boats completed between 1966 and 1971, and followed on from the first British SSN, DREADNOUGHT. These five boats were due to reach the end of their operational careers in the mid-1990s, but a combination of reactor problems and the need to cut expenditure has led to the deletion of three in 1990-91, leaving just two (VALIANT and COURAGEOUS), which, despite recent refits, are also likely to be stricken in the near future. It has been a successful class. CHURCHILL carried out the UK trials for Sub-Harpoon and was also one of the first Western submarines to be fitted with anechoic tiles to reduce the acoustic signature. CONQUEROR remains the only nuclear-powered submarine in any navy to have sunk a hostile surface warship (ARA GENERAL BELGRANO; May 2, 1982).

The six SWIFTSURE class boats were built in the 1970s, introducing a new pressure-hull which maintains its diameter for a greater proportion of its length than in the earlier classes, giving much greater usable internal volume. The forward hydroplanes are fitted in the bow below the waterline and retract into the outer casing. They have a very quiet hull form and all were given elastomeric acoustic tile coatings during their first refits. They are powered by PWR-1 reactors with a core which gives a theoretical life of 12 years, although the refueling cycle will probably be about 8 years. They are fitted with five torpedo tubes, one less than in the earlier SSNs. Each boat is undergoing a 30-month mid-life refit, the first being completed in 1987, the second in 1989 and the third in 1991, with the remainder following at two-year intervals. Assuming the usual 25-years operational life, the SWIFTSURE will be due for replacement between 1998 and 2006.

The TRAFALGAR class was ordered in 1977, the first-of-class joining the fleet in 1983; the seventh and last will be commissioned in 1992. These boats incorporate yet further improvements, including a new type of conformal anechoic tiling on both the pressure and outer hulls. All have strengthened fins and retractable bow hydroplanes for under-ice operations. TRAFALGAR is fitted with a conventional 7-bladed propeller, but all subsequent boats have a shrouded, pump-jet propulsor -- a major British breakthrough in underwater technology.

## THE PLAN IN 1990

The plan for the future of the submarine force as the Cold War drew to its close was fairly straightforward. The first three VANGUARD class SSBNs had been ordered and a contract had been placed with Vickers in 1987 for design work on the new W (SSN-20) class SSNs, with project definition having started in 1989. The plan was for a class of six (possibly seven), with the first being ordered in 1993 for commissioning in 2000. Also, construction of the first four UPHOLDER class SSKs was well in hand, to be followed by five (possibly eight) of a larger *Batch 2* design.

All this was thrown into jeopardy by the end of the Cold War and the consequential reassessment of defence needs carried out by the Government and the Ministry of Defence in 1990/91. After considerable discussion, much of it behind closed doors, the new plan is now becoming clear. The Royal Navy will reduce from some 31 submarines to 20, of which four will be SSBNs, four will be SSKs and the balance of 12 will be SSNs. This, as always, will be the fleet total, and of the 20, those available immediately or at very short notice will be 2 SSBNs, 3 SSKs and 7-9 SSNs, while with adequate notice the number of SSNs might increase to 10.

With three of the VANGUARD class already under construction and the fourth and last of the UPHOLDER class launched and fitting out, speculation about the future can be limited to the SSNs. It has already been officially declared that development of the W (SSN-20) class has ended. Thus the replacement for the SWIFTSURE class, which must join the fleet between 1998 and 2006, could either be a development of the TRAFALGAR class (which is variously reported as an *Improved TRAFALGAR, TRAFALGAR Batch 2*, or even *SSN-19½* !), or a scaled-down VANGUARD design. Whichever of the designs is selected, the aim must be to construct two to four boats in the mid-1990s.

There will then, however, be a need to replace the TRAFALGAR class in the 2005-2010 time-frame, which fortuitously coincides with the French Navy's requirement to replace their RUBIS class SSNs. Tentative moves are thus being made towards a collaborative programme, with the UK using development work already done on the SSN-20 project and the French their work on the AMETHYSTE and Le

TRIOMPHANT classes.

The history of European naval collaborative projects has not been particularly good; the collapse of the NATO Frigate programme being a recent example. However, there have been some good examples of Anglo-French programmes; several sonar projects have been successful and the current Anglo-French Future Frigate programme has gone well so far.

## CONCLUSION

The end of the Cold War and the subsequent collapse of Soviet power has necessitated a fundamental review of Western military forces and it is not surprising that reductions should be sought in expenditure, manpower and commitments in all areas of defence. However, there comes a time when reductions are so deep that they threaten the viability of what remains and it is this writer's view that planned reductions in the British submarine force have reached that point.

The SSBN force of four VANGUARD class is the bare minimum to achieve a guarantee of one boat always at sea. However, one such boat with sixteen Trident II (D-5), each with eight warheads, packs sufficient power to serve as a deterrent for the foreseeable future. Apart from the Soviet Navy, there is no naval force likely to have the capability to find, let alone destroy, such a vessel while it is on patrol, at least for the foreseeable future.

The SSK force of four boats is also at the absolute minimum. It is unlikely that in a sudden crisis more than two will be available, although a third *should* normally be available at short notice. In such a small force, however, a mechanical problem or a minor collision could make one boat unavailable for several months, with disproportionate effects of front-line availability.

The most serious worry, however, is with the SSNs. Government policy is to have a force of *about* 12 boats, of which 7-9 *should* be available at any one time, which *with adequate notice might* be increased to ten. The qualifications are emphasised, since experience indicates that British governments take full advantage of lower limits.* The SSN has proved to be one of

* Miller's Law predicates that any British government statement of "around" or "about" means that the most you will get is the minimum figure quoted less 10 percent (if you are lucky!). Thus, for example, the current figure for the future surface fleet is stated to be "around 40 destroyers / frigates," which, by this methodology, means 36 at most.

the most powerful, flexible and influential of all modern weapons systems. The use of CONQUEROR in the Falklands War showed that since the Argentine Navy had no way of detecting such an SSN, it had to assume that she (and maybe at least one more SSN) could be anywhere in South Atlantic waters. As a result, once CONQUEROR had sunk the GENERAL BELGRANO, the Argentine surface fleet was effectively prevented from any further operations which could have seriously threatened the Royal Navy task force.

The British series of SSNs has been particularly successful, even though built in small numbers. But even smaller numbers in the future will exacerbate the problem of the industrial base. There is only one British shipyard capable of building nuclear boats: Vickers (VSEL) at Barrow-in-Furness. VSEL has already suffered from lack of continuity in orders, but the future will be worse. There is unlikely to be another SSK order from the Royal Navy for a decade and once the fourth SSBN has been completed there will be no more orders for such boats for some twenty years. Thus, without export orders (and the British have not exported any new-build submarines since the OBERON class) the work is likely to be very sporadic and even when they do have such work it will be at a low intensity.

Thus, the position of the British Submarine Service is that it remains firmly in the business and that the quality of men and materiel will be as high as ever. But, the quantities will be less even than now and thus the ability to deal with sudden and unexpected crises will also be reduced. Will it be sufficient to meet the new and unpredictable threats in a highly uncertain world? Only time will tell.

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## 1991 NSL FACT BOOK
### Errata

There were several administrative errors made in the preparation of the 1991 Fact Book. The correct data is summarized below:

- Page 13, change to Captain Thomas J. Flanagan.
- Page 14, change to Admiral Harold E. Shear.
- Page 66, change location of Submarine Squadron TWO to Groton, CT.
- Page 67, change location of Submarine Squadron TWENTY-TWO to La Maddalena, Italy. Change USS Tecumseh's hull number to SSBN 628.
- Page 68, under Submarine Squadron THREE, add: USS Haddock (SSN 621), USS Pogy (SSN 647) and USS Houston (SSN 713). Delete USS Houston (SSN 713) from Submarine Squadron SEVEN.
- Page 69, change Greenling's hull number to SSN 614, location to Groton. Change Gato's hull number to SSN 615 and location to Groton. Add SSN 621 Haddock, San Diego.
- Page 70, Change L. Mendell Rivers' hull number to SSN 686. Change City of Corpus Christi's location to Groton.
- Page 107, change PERS OOW to PERS 003.

*[The homeport assignments for submarines change frequently. The Fact Book lists the current assignments as each issue goes to press. No further attempt will be made to keep the list up-to-date. The local submarine area commander's office should be consulted for a current listing of submarines assigned to a particular homeport]*

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# COMMAND AND CONTROL OF SUBMARINES AND THE SUPPORTING COMMUNICATIONS: Misunderstood Model for $C^3$ in the Stealth Environment

*by Rear Admiral W. J. Holland, Jr., USN(Ret.)*

Commentators on defense matters have a tendency to deal with communications as a singular mechanism in isolation from the ends being accomplished by the operational process in which it acts. Dealing with communications in isolation from the scenario, task and process is a continuing source of serious error. Before describing what a communications system ought to be able to do, one must be clear as to the forces to be supported, the scenario in which they are to operate, and the command and control ($C^2$) process which will control them.

Because these considerations are difficult to predict and define, they are often ignored. Though communications for infantry battalions are manifestly different than for fighter planes, such distinctions are often missing in analyzing requirements. In particular, communications supporting submarines are often characterized as difficult or impossible without regard to the mission to be performed or the command and control process appropriate to the forces to be employed.

No more serious error exists in the command and control field than that made by those who prescribe requirements for sea based strategic forces identical to those for land based forces. The most glaring example of this failure is translating the need to launch bombers and ICBMs quickly before they are destroyed in an attack (launch under attack) to demands for two way instantaneous full time communication to submarines which are invulnerable. Communications supporting ballistic missile submarines ON ALERT bind those weapons as tightly to the National Command Authority as any Launch Control Center in Wyoming or Missouri. But the procedures for submarines are as different from those used to control SAC's bombers and missiles as the geography of the sea is different from the land. Those who expect the communications which support the two to be the same don't understand the process of either.

Communications are an integral part of a particular command and control process. The whole process needs to be examined and understood before one can make judgements on

the utility of any part of it. The procedures and arrangements of military command and control vary with the forces involved, react to different scenarios in different ways, and need communications based as much on tactical doctrine as on equipment or technology. The end-to-end command process includes not only the forces and their commanders but also the environments in which the process will operate and the scenarios in which it will play.

The interaction by radio of armored forces' commanders in Desert Storm would have been markedly different had there been an opposing Electronic Warfare (EW) structure which could have targeted and exploited those transmissions. Command and control and communications ($C^3$) processes differ with each scenario, each environment, and in some ways with individual commanders. The function of doctrine and training is to create a $C^3$ process able to perform adequately in the widest ranges of situations within the physical limits of environment and equipment. To generalize one situation into a requirement applicable to all invariably leads to error.

A careful examination of communication systems supporting various forces discloses that submarine communications appear very robust, adaptable to a wide range of scenarios and with fewer limitations than most. This analysis holds even when faced with the inability to transmit messages throughout the submarine's entire operating envelope or to receive high data rate messages while *fast and deep* or under the ice. In the past twenty years, technological advances have given submarines some communications capability even in these most limiting situations.

A major reason that submarine communications are so capable is that the $C^2$ process in which they operate **demands much less** of its communications than arrangements controlling other forces. In submarine $C^2$, there exists a very large data base which is common to the commander and commanded. This data base is not only informational but cultural. As data bases in interacting nodes grow, the amount of communications needed to connect them decreases. If two entities had infinitely large data bases, there would be no need to ever exchange data -- both would know everything. Moving away from this ideal, information exchange increases in relation to the differences between the data bases. If, as in the case with most submarine

operations, the data base difference is usually ONLY new information, then the amount of data exchange required is small. Furthermore, creating rule-based systems for operations and information exchange, as submariners have, makes negative information useful. Such arrangements allow conclusions to be drawn without information being exchanged overtly.

Submarine command and control processes capitalize on these features. Rule-based systems for operations provide positive knowledge to the initiated. "How do you know the submarine is there?" asks the General. "Because he didn't tell me he wasn't!" replies the Submarine Operating Authority. This sort of procedure is second nature to those working in artificial intelligence but is rare in other military environments. Such mechanisms work where the common data base is cultural as well as informational. Here the process of command becomes more important in determining the type and nature of communications than the type or nature of the data to be exchanged.

In his book Command, Control, and the Common Defense, (Yale University Press, New Haven and London, 1990) Lieutenant Colonel C. Kenneth Allard, USA, examines the phenomena in detail. He points out the limits of *jointness* and demonstrates the additional burden on a $C^3$ process when commanders are not familiar with the tactics or competent in the disciplines of the missions being conducted. Submariners have long recognized this difficulty. The processes for submarine $C^3$ are best exploited by commanders who are submariners. The cultural bond between commander and commanded is vital in exploiting the advantages a common data base provides while intrinsic to limiting communications between the parties. Such schemes are not unique to submarines: special forces and spies demand similar considerations.

The common data base feature helps explain the effectiveness of a command and control process which uses what appears to be one way communications. This is perhaps the least well understood feature of the submarine command and control process because it seems foreign to other $C^3$ systems, particularly those constructed by less well trained and disciplined forces or which support more loosely organized hierarchies. The model for the submarine system is not the telephone but commercial broadcast radio. Management of American farms

has depended on radio-delivered weather and farm price reports for years. Traffic reports in all large cities influence vehicular flow in the event of accidents or other impediments. In these scenarios, hundreds of independent decisions are made without any acknowledgement of either information received or the actions decided.

Submarine communications have grown over the past 40 years to provide for a multiplicity of paths and mechanisms. Their equipments are adaptable to a wide range of missions. Critics often draw scenarios to illustrate fragility of submarine communications by presuming the submarine is performing one task while creating requirements appropriate to a different mission. *A submarine is fast and deep while the war breaks out so he is ignorant of that for (fill in the blank) hours.* Such descriptions are created to show how submarines are inadequate for some task or as justification for expensive equipments to fill a particularly narrow mission.

But in describing the communication systems to be needed, one must be careful to define the missions **and the environment** in which they will be used. In Third World Conflict/Limited Intensity Conflict (TWC/LIC), not only is the submarine most likely to be operating in the near surface boundary but there will not be any ASW threat. In this, as in the vast majority of situations needing real-time two-way communications between submarine and the next echelon, no ASW threat worthy of the name exists. Reasonable antenna exposure will be perfectly acceptable and constant antenna exposure may be the norm. Submariners have overstated the threat to themselves by antenna exposure -- even in the presence of a good ASW capability. All who have worked against American surface and air ASW forces -- the world's best -- know from experience that the probability of detection of masts and antennae by surface and air ASW forces is relatively low.

Command and control and communications ($C^3$) is a package. When examined together, submarine $C^3$ is as good as, and in many instances superior to, other American military $C^3$ systems. The large common experiential and doctrinal data base permit low data rate communications to be adequate and limit requirements for transmissions from front line forces to a minimum. The redundant and repetitive paths for communications provide a reliability and adaptability which is the envy of

other services and warfare specialties. The careful screening of information sent to the ships on the one hand, and the conscious effort to provide all useful information to the ship at sea on the other, avoids data constipation and the need for huge circuits while providing all necessary tactical information. Keeping individual unit commanders well informed of the plans and intentions of the higher levels of command keep the data bases at sea and ashore common and *in synch*. Well trained forces and highly experienced commanders are the final ingredients to the success of this command and control process.

Contrary to popular opinion, communications for submarines are very robust. The entire radio spectrum is used save the SHF band (see Figure 1.). Each portion has its special utility. The flexibility and capability of this array is a tribute to those who have been responsible for its development over the past thirty years.

As good as the system is, it would be improved if communications to and from the submarine were possible throughout its operating envelope. In moving toward this ultimate objective, i.e., at all speeds and any operating depth, radio remains the only real hope in the near term. Alternatives proposed are acoustic or laser -- both schemes have their promoters.

The discovery of a workable underwater laser receiver demonstrated that mechanism to be scientifically possible. However transmitters capable of operation from a space based platform -- necessary to achieve wide area coverage -- have yet to be proven. And as difficult as the transmission from space to the ship may be, transmission from a submarine below the surface to a space based receiver will be many more times as difficult.

Bottom deployed arrays using acoustic links are feasible but deployment is difficult and such a system could be vulnerable to covert exploitation. Both acoustic and laser mechanisms are expensive. A space based laser one-way system has been estimated to cost on the order of two to four billion dollars.

Radio remains a proven, understood, reasonably economic technology, at least for this century. Efforts in this medium should provide better antennae, mechanisms to deploy antennae from greater depth and at higher speed, data compression and signal processing improvements. All these improvements are feasible, though substantial engineering effort is required.

More important than communications data rate will be the employment of the vastly larger and much more useful informational data bases now being created. The increased capabilities of optical imaging data system (familiar as the compact disk recording) permit such action now. Already capable of storing the Encyclopedia Britannica in the volume of a couple of 12" record disks, this technology promises to explode the growth of the common data base criteria described above. It will not be long before every submarine could have the ability to store every fixed target for land-attack weapons in the world. Coupling this target location with precision location available from the Global Positioning System, $C^3$ related to such attacks will be reduced to a Maxwell Smart style order, *Execute Plan B.* Prepositioned information will be limited only by planners' imagination and preparation time. Information management systems will permit easy alterations to prepared plans. Communications requirements will go down because the ends of the communication path will be in possession of a wide variety of easily found doctrine, plans and proposals.

These improvements in information systems handling, stowage and retrieval will lessen the burden on communications. Reducing the amount of information which must be transmitted between parties also reduces the vulnerability of that information to intercept, exploitation and countermeasures. The present $C^3$ system represents a superb design, perfected over many years. Even if instantaneous, secure, low probability of intercept, two way communications were offered, submariners would be wise to be cautious in changing their $C^3$ philosophy.

In World War II, the German submarine campaign was brought to a halt by Allied exploitation of communications from the U-boats to support the German's highly centralized, rigid, information-hungry command. Few lessons in history have been so clear. American submariners have learned this lesson and the present command and control system has been fashioned to avoid just such a mistake in the future. That system should not be jeopardized for the sake of reassuring commanders or their staffs who are ignorant of the environment, tactics or methodology involved. Just the opposite should prevail in an era where electronic warfare capabilities promise to be ubiquitous. Submarine systems and procedures offer a model for other forces interested in operating stealthily in an environment in

which electromagnetic transmissions of any kind will draw fire.

**FIGURE 1.**
**SUBMARINE COMMUNICATIONS SUMMARY**

| Frequency Band | Data Rate | Earth Coverage | How Deep? | Speed Limits | Two Way? | Earth Nodes |
|---|---|---|---|---|---|---|
| ELF | Very Low | Global | Pretty Deep | Pretty Fast | No | One |
| VLF | Low | Global | Fairly Deep | Pretty Fast | No | Six |
| LF | Low | Northern Hemisph. | Not too Shallow | Not so Fast | No | About a Dozen |
| HF | Medium | 1,000 Miles | Near Surface | Moderate | Yes | Thou-sands |
| VHF Slot Buoy | Low | 100 Miles | Pretty Deep | Fast | No Send only | All MPA & S-3 aircraft |
| UHF/ Direct | High | Line of Sight | Near Surface | Moderate | Yes | Thou-sands |
| UHF/ SATCOM | High | Global (*) | Near Surface | Moderate | Yes | Plenty |
| SHF SATCOM | Higher | Not used in submarine applications because of limitations of satellite power; resulting antennae is too large for small ships. | | | | |
| EHF/ SATCOM | Very High Indeed! | Global (**) | | Moderate | Yes | Several |

* But polar coverage (north of Arctic Circle) tenuous and problematical.

** Polar coverage will depend on number of MILSTAR satellites placed in orbit and the location and nature of these orbits. ■

# CANADIAN SOVEREIGNTY AND THE NUCLEAR SUBMARINE PROGRAM

*by Nathaniel French Caldwell, Jr.*

*[Ed Note: Defense policy makers and others interested in North American and NATO security often fail to appreciate the Canadian obsession with sovereignty. Commander Caldwell has studied the effect of sovereignty on Arctic defense and the decision for, and reversal on, the Canadian nuclear submarine program. His major work on this subject, Arctic Leverage: Canadian Sovereignty and Security (Praeger: New York, 1990) was released in August 1990. He is currently assigned as the Navy Federal Executive Fellow at the Brookings Institution. The views expressed herein are those of the author and do not reflect the official policy or position of the United States Government.]*

**On Canadian Sovereignty.** For a country with the longest coastline in the world and a relatively small population, a self-sufficient maritime defense is largely problematic. Despite the odds, the Canadian government announced a *three ocean* concept of maritime defense in its 1987 White Paper. The key to this defense was to be a Canadian nuclear attack submarine program. The program was small -- ten to twelve submarines. However, as in air defense, Canada has a trump to get the attention and maybe the cooperation of the United States: sovereignty in the Arctic.

**The Beginnings of a *Canadian* Defence Policy: The 1964 White Paper.** Canada's defense had always been subsumed in British defense, or North American defense, or NATO defense. In 1964 the Canadian government issued White Paper on Defence, an attempt to focus on Canadian defense needs. The 1964 White Paper set out to define "defence of Canada." Notably, points in the 1964 White Paper's definition of "defence of Canada" required a maritime strategy to support the Canadian defense establishment's new role of sovereignty protection -- e.g., surveillance of territorial waters and the ability to deal with incidents there. The Soviet submarine threat was still growing; by 1964 Soviet ballistic missile submarines could launch their missiles submerged. United States submarines were operating freely in the Arctic. The USS SEADRAGON had made the first submerged transit of the Northwest Passage in

1960; A Canadian observer was onboard.

Despite the growing Soviet submarine threat and Canada's NATO commitments, the paper was not successful in establishing a need for a strong Canadian maritime presence. No Canadian strategy to counter the increased maritime threat appeared. By 1968 the Navy had shrunk to 28 warships, although four new helicopter destroyers for ASW were proposed. Of course, the maritime threat was submerged and therefore not publicly visible. Canada's inability to control waters she claimed did not become visible until the voyage of the experimental tanker MANHATTAN through the Northwest Passage.

**The MANHATTAN Crisis.** When the MANHATTAN set sail from Chester, Pennsylvania, on 24 August 1969, the passage had been completed by only eight surface vessels, the GJOA, the ST. ROCH, two Canadian and four American icebreakers. Completely submerged transits had been made by the United States nuclear attack submarines SEADRAGON and SKATE. The MANHATTAN was the first merchant ship to complete the Northwest Passage.

Humble Oil and lesser partners, British Petroleum and Atlantic Richfield, sponsored the tanker's experimental voyage but sought governmental assistance. The Canadian government cooperated from the outset. The Canadian icebreaker JOHN A. MACDONALD accompanied the MANHATTAN, although the United States government had not made an official request for an escort. The American icebreaker NORTHWIND also escorted the MANHATTAN, but the smaller American icebreaker was underpowered and fell behind. On the return trip the USCGC STATEN ISLAND joined the party, and the new CCGS L.S. ST. LAURENT, then the world's biggest and newest icebreaker, interrupted sea trials to meet the party in the Prince of Wales Strait. Bad weather prevented scheduled, token participation by a Soviet icebreaker. The JOHN A. MACDONALD was the workhorse of the party, several times breaking the tanker free from ice. Usually, though, even the JOHN A. MACDONALD travelled in the tanker's wake, since at full speed the tanker could easily burst through ice that would have trapped the Canadian icebreaker.

The political fallout from the voyage was significant. The high level of public concern can be attributed not to a perceived

violation of territorial sovereignty but to the less direct sovereignty erosion caused by American capital. Already American companies owned almost all of Canada's producing natural resources. Now Americans were trying to open up the far North, the treasure house of mineral riches.

When MANHATTAN transited the Northwest Passage, Canada still recognized a three-mile territorial sea. Thus the passage could be navigated in international waters. In December 1970, however, Canada decided on a twelve-mile territorial sea. That meant some small islands in the Parry Channel could conceivably extend territorial waters across the channel. However, the territorial sea is generally measured from the larger land mass, not minuscule islands lying off the coast.

For a merchant ship, whether the Northwest Passage is territorial waters, an international strait, or high seas is a moot point, since the right of innocent passage applies. It is customary for warships to notify the affected country of their intent to cross territorial waters. To consider American icebreakers as warships would be to stretch the point, and in any event notification of transit is only a formality not required by international law. So, whether considered as territorial waters or high seas the voyage of the MANHATTAN and her escorts did not violate international law of the sea. From the Canadian perspective, however, the waters of the Arctic archipelago are not international and are not territorial -- they are Canadian.

The MANHATTAN crisis spurred the Canadians to pass the Arctic Waters Pollution Prevention Act of June 1970. This law proclaimed Canadian jurisdiction over pollution control out to 100 miles from land in the region above 60 degrees north. That allowed Canada to claim some legal jurisdiction over all vessels operating in the Arctic archipelago, and it particularly discouraged tanker transits. The only country to recognize Canadian jurisdiction over pollution control in the Arctic archipelago was the Soviet Union which had long maintained effective control over the Northeast Passage. The United States and some of the Western European countries openly disputed Canadian jurisdiction over Arctic waters. They wanted an international or regional solution to the problems of Arctic pollution and navigation.

**The 1971 White Paper.** In the 1971 White Paper Defence in the 70s the government of Pierre Trudeau stated that its first

national concern was the:

> "re-examination (of defense responsibilities) as a result of Government decisions to regulate the development of the North in a manner compatible with environmental preservation, and with legislation enacted to prevent pollution in the Arctic and Northern inland waters."

Evidently, Canada planned to defend the waters of the Arctic archipelago as inland waters.

The 1971 White Paper assigned the armed forces to defend the "sovereignty and independence" of Canada from "external challenges," which were defined as "actions by foreign agencies or their nationals involving territorial violations or infringements of Canadian laws governing access to and activity within these areas." The paper mentioned the potential of oil spills and challenges to Canadian control of resources on the seabed of the continental shelf. Apparently, "external challenges" was a euphemism for the United States.

**The 1987 White Paper.** Towards the end of the Trudeau government it became apparent that the maritime defenses of Canada had been seriously neglected. The Canadian Senate Sub-committee on National Defence, in its 1983 report Canada's Maritime Defence concluded: "By running down its forces, as it did in the late 1960s and through the 1970s, Canada contributed not to raising but to lowering the nuclear threshold." A Special Joint Committee on Canada's International Relations in June of 1986 found "that there is a requirement for Canada's maritime forces to be equipped to perform a sea-denial role in waters over which Canada claims jurisdiction." It was pointed out that MARCOM had not been given the tools to do the job despite "enormous additions to Canada's maritime jurisdictional claims:" the twelve mile territorial sea (1970), the two hundred mile economic exclusion zone (1982), and continuing historical claims to sovereignty in the waters of the Arctic archipelago.

To arrest the decline of the Navy, the committee recommended a maritime defence policy that built up to "a balanced fleet within twelve years." The proposed force included sixteen frigates (twelve new frigates plus four of the Tribal class) and twenty diesel-electric submarines.

The Conservative government of Brian Mulroney came to power in 1984 with the belief that it had a mandate to upgrade

the Canadian Forces. The Mulroney government intended to issue a preliminary paper on defense shortly after coming to power but then decided to wait for the completion of air defense negotiations with the United States. Meanwhile, the government was able to stop the downward spiral of the Canadian Forces by getting real increases in defense spending of over 2 percent a year. However, without a review of defense commitments the money was spread thin through all areas and was barely enough to maintain the status quo.

The White Paper which had been promised for 1986 was not issued until June 1987. By that time the only unanswered question was what was the government going to do about MARCOM. The frigate program had already been extended to a proposed twelve new frigates above the six already under contract. In May 1987 the government had put forth a tentative proposal for a nuclear submarine program, but it had not been approved by the cabinet. The Canadian Submarine Acquisition Program (CASAP) had been underway for some time and had already ruled out nuclear submarines. Although nuclear submarines had been proposed in 1964, and considered again in 1983, they were rejected by CASAP as too expensive. Despite the initial cabinet resistance the government announced in the White Paper that it would acquire a force of ten to twelve nuclear powered attack submarines. The program was estimated to cost C$8 billion.

**The Nuclear Submarine Decision.** When the results of the CASAP review of conventional submarines were presented to Defence Minister Perrin Beatty in late 1986, he directed MARCOM to consider the nuclear option before the White Paper was published. Beatty apparently remembered that a review of Canada's ability to construct, operate, and support nuclear submarines had been ordered in 1985 by his predecessor. That review was not concerned with a detailed analysis of costs and effectiveness. With information gleaned from the United States Navy, some information obtained from French and British parties vying to supply the submarines, and from its own review of Canadian capabilities, MARCOM was able to give Beatty what he concluded was a well-founded analysis favoring a Canadian nuclear submarine program.

The nuclear submarine proposal ran into opposition in the cabinet even before the White Paper's release. However,

Beatty silenced some of the critics by pointing out that only nuclear submarines could patrol the Arctic. The United States would have to acknowledge Canadian effective control of the Northwest Passage and the rest of the waters of the Arctic archipelago when planning Arctic operations.

Nuclear attack submarines are one way that would make the *three ocean* concept announced in the White Paper work. The White Paper noted a lesson from the Falklands war: "Through their mere presence, nuclear submarines can deny an opponent the use of sea areas." Prime Minister Mulroney went further to claim in an interview with Macleans that Soviet submarines were in the Canadian Arctic on a "regular basis." Importantly, the White Paper's *three ocean* concept would link Canada's maritime interest to NATO security. Nuclear submarines could be used for surveillance and control in the Arctic and also to help keep open sea lanes to resupply Western Europe or to protect shipping in the northeast Pacific.

Talks with the United States on the issue of the Northwest Passage had begun shortly after the disputed transit of the USCGC POLAR SEA through Canadian claimed waters in 1985 and concluded on 11 January 1988 with an agreement to develop *cooperative procedures* to facilitate icebreaker navigation. Without recognizing any Canadian claim to jurisdiction over the waters of the Arctic archipelago, the United States would request permission for marine research and the transit of American icebreakers. Notably, the agreement did not apply to submarine operations in the Arctic.

**A Change of Ministers.** Prime Minister Mulroney's government was re-elected on 21 November 1988. The elections were primarily a referendum on the free trade pact, but the submarine program was hanging in the balance, too. The White Paper had been under attack for over a year before the elections with the nuclear submarines as the primary target of the attacks. In January 1989 Douglas L. Bland, a defense analyst at the Centre for International Relations in Kingston, Ontario, pointed out several factors which could disrupt the consensus that held together the White Paper: a shift of senior government officials or Canadian Forces officers, a breakdown of the defense funding formula, or the departure of Beatty as Minister of Defence.

After the elections the government was faced by a fiscal

crisis. Signals of a struggle within the cabinet for control of scarce resources began to appear immediately after the elections. At the end of January, Perrin Beatty, the Minister of National Defence and prime driver behind the nuclear submarine program, became the victim of a cabinet reshuffle which made him Minister of Health, and William McKnight, Minister of Defence. With Beatty removed from the Ministry of Defence the consensus that had held the White Paper together was gone. Both the 1964 and 1971 White Papers had fallen apart shortly after the minister had left office.

Minister of Finance, Michael Wilson, released his fifth budget on 27 April 1989. The previous day leaks of huge cuts in defense spending had been made to the press. Due to the tremendous secrecy that surrounds budget preparation in the parliamentary system, an uproar in the Commons ensued which called for Wilson's resignation. The budget included direct program cuts of C$3.6 billion dollars over two years, one third of which came from defense. The biggest savings came from scrapping the proposed nuclear submarines.

Douglas Bland's list of ingredients for failure of the White Paper became complete in the summer of 1989 with a shuffle of naval officers that replaced Admiral Charles Thomas with Admiral Robert George as chief of the Maritime Command. The only senior officer who knew the status of the SSN program, Rear Admiral John Anderson, has been removed as Nuclear Program Manager and sent back to operational programs in Ottawa.

Canada's turnaround on the nuclear submarine program following the 1987 decision to abandon conventional submarine plans leaves Canadian maritime defense policy disjointed. Minister of Defence McKnight claimed that government defense policy will still be based on the 1987 White Paper. However, without a means to patrol Arctic waters the *three ocean* concept is hollow. For the foreseeable future McKnight has admitted that Canada will have to rely on its allies to patrol the Arctic.

**Conclusion.** The 1964 White Paper recognized the necessity of sovereignty protection as a function of defense policy and proposed that Canada should provide for as much of its own defense as possible. In that regard the paper proposed to buy two or three nuclear submarines for ASW. However, American

and British restrictions on access to nuclear propulsion technology made the proposal dependent on Canada's development of an independent naval nuclear program, a prohibitively expensive proposition.

Canada's lack of maritime capability in its own Arctic was invisible to the public eye as long as the challenger was a submarine. The MANHATTAN's voyage in 1969 unmasked Canada's inability to control the waters of the Arctic archipelago. In 1985 the United States icebreaker POLAR SEA transited the Northwest Passage without specific, official Canadian consent, although there was a Canadian government representative on board. The transit exposed Canada's failure to establish *effective control* of Arctic waters that it claimed. The new Conservative government determined to take actions that would ensure Canadian sovereignty in the Arctic archipelago.

The strategic significance of access to the Arctic for submarines is readily apparent. The Arctic is where the globe narrows down like the hub of a wheel. A submarine entering the hub has access to any of the world's oceans. Anyone who has ever worked in the E-ring of the Pentagon is familiar with the fact that it is usually quicker to walk into the inner ring of the Pentagon and back to the outer ring than to walk from one point to another in the outer ring. This focal nature of the Arctic is made more significant by the number of high value bases and early warning sites on its littoral.

What has survived from the 1987 White Paper is that Canadians need a defense policy that they can recognize as their own. The *three ocean* concept provides a Canadian perspective of maritime defense, but its implementation costs more than Canada is willing to pay. The *three ocean* concept designed to complement Canada's assertion of sovereignty over the Northwest Passage with NATO's now-defunct maritime strategy could still act as leverage to put a Canadian voice in any multilateral Arctic maritime defense relationship that may develop. However, the potential now for Soviet or Russian participation in such a relationship adds more uncertainty for a Canada that plays only a minimal role in the security of the waters it claims as its own. Maritime defense proposals announced in September 1991 call for three new replacement submarines but offer nothing to provide a continuous Canadian defense capability in Arctic waters. ■

## AFFORDABLE SUBMARINE COMBAT SYSTEMS

*by Daniel A. Curran*
*Marketing Manager*
*Submarine Signal Division of Raytheon Company*

The cost of modern nuclear submarines has increased in recent years to a point where the Submarine Force and its advocates in Washington are receiving enormous pressure from Congress to design a new, less costly submarine as a complement to SEAWOLF. One important part of a submarine is its combat system, the electronic *heart* of the ship. We need to put the cost of the combat equipment into proper perspective: How we build military electronics today and how we might better build combat systems in the future at a lower cost. Two issues exist with building a less costly submarine. The first is tied to **what** we want the ship to do for missions; the second is involved with **how** we build the ship to perform the mission.

The Navy is responsible for stating **what** the new submarine should do for its missions. The product of this effort is called the operations requirement.The idea of building a submarine or any naval ship that fails to meet stated operational requirements cannot be supported. Jerry Holland in his articles, "Who says Smaller is Better," Submarine Review, January 1991, and "SSN: The Queen of the Seas," Naval War College Review, Spring 1991, addresses the issue head on. Although some of his premises are challenged in the Naval War College Review by two other submariners, the basic tenet that a modern submarine should meet its operational requirements is firm and is not challenged here.

The second issue is that our modern submarines are being built to exacting military standards and to specified acquisition policies that have a large cost attached. The issue at hand is whether we (the Navy and industry) can build modern submarines that meet a stated mission requirement at a lower cost than we do today. The answer is "yes" but first we need to dissect the submarine costs to identify the cost drivers.

A recent paper by John Johnston, Doreen O'Colman, and Cathy Mathia of the Naval Sea Systems Command Cost Estimating and Analysis Division, dated April 11, 1991 and

submitted to the Association of Scientists and Engineers 28th Annual Technical Symposium details the cost drivers for both the SSN 688 classes and the SEAWOLF SSN-21 class of submarines. The paper breaks the costs of the SSN-21 into two parts -- the platform costs and the payload costs. Propulsion and auxiliary systems make up 43 percent of the platform cost or 35 percent of the end cost of the submarine. The AN/BSY-2 combat system makes up 80 percent of the cost of the payload or 15 percent of the end cost of the submarine.

There are also informative comparisons in the paper relating to cost trends for both the SSN-688 and the SSN-21. The trend we should be concerned with is the total cost of the platform and the cost growth in the combat system payload.

What we should challenge is **how** we build the ships and **how** we design and build the equipment we put in them.

For the combat equipment, this challenge is divided here into four broad objectives:

To Design and Build Combat Equipment:

1. that reduce the impact on the ship's displacement by reducing the number of people needed to operate the equipment, and by using modern sensor array arrangements;
2. that use advances of modern commercial hardware and software, and will be flexible enough to upgrade in the future without major redesign costs;
3. under a set of acquisition rules and standards that reduces the associated overhead cost; and
4. that reduce the cost of long term support at sea and ashore.

The overall objective might be to design combat equipment that use 50% less people to maintain and operate, cost 50% less to build and cost 50% less to support. These objectives should be met while increasing operational performance against all projected threats. This can only be accomplished by modifying our expectations and requirements.

## REDUCE THE SHIP DISPLACEMENT BY SENSIBLE SENSOR ARRAY ARRANGEMENTS AND A SMALLER SIZE CREW.

The acoustic sensors aboard the LOS ANGELES (SSN-688) class have evolved from the earlier attack submarine classes. They consist of a large spherical array in the bow area of the

ship providing active and passive sonars and a towed passive array deployed from the stern sector. One ship, the USS AUGUSTA (SSN-710), was modified for the wide aperture array sensors. The wide aperture array suite consists of large rectangular passive receiving arrays located in sets of three down each side of the submarine -- one array forward, one array amidship, and one aft. The wide aperture array is used for rapid passive localization which allows the ship to shoot a torpedo on a solution that is electronically processed much faster and more accurately than the older manual methods like Ekelund Ranging.

Other submarine sensing equipment, like the periscopes, result in large hull penetrations which are expensive but, more importantly, restrict the location of the combat center to the upper part of the hull below the sail area, thus limiting the marine designer's flexibility in equipment arrangements.

The size of the crew is first determined by the required maintenance load and then by the required watchstanders. The fact is that most of the maintenance can only be performed in port. Furthermore, we still put an operator in front of every sensor display while at the same time providing him with significantly greater processing power in the form of workstation electronics, RISC (reduced instruction set computers), and very powerful signal processors.

The time has arrived to examine every combat system convention and set goals to upgrade the sensor arrays and reduce the size of the crew.

SUGGESTION 1 - Add a detection capability to the wide aperture array, fill in between the wide aperture arrays with medium frequency passive receiving flank arrays and eliminate the spherical array. The towed arrays and a wider frequency hull receiving array will perform more efficiently against the modern threats. Add a much smaller passive receiving array and active transmitting array to provide coverage in the forward area.

The displacement difference is considerable and we can put the torpedo tubes back in the bow section of the ship and perhaps increase the weapon load.

SUGGESTION 2 - Provide a more efficient layout of the combat functions by using non-penetrating sail sensors (do we even need so much sail?). Place the combat space at the

middle level where the maximum beam of the ship can be used to advantage.

SUGGESTION 3 - Reduce the size of the crew by manning the submarine with operators and watchstanders only and leave the maintenance crew ashore like we did in World War II. Design the systems to be fault and casualty tolerant.

SUGGESTION 4 - Reduce the crew even more by combining combat watch stations with sensor watch stations. We may not be able to afford the communication time lag in a melee and, "Jonesy" will have to learn a couple more skills. This must be qualified however. Much more progress will have to be made in automating the signal analysis functions.

## USE MODERN FLEXIBLE ELECTRONICS AND COMPUTER SOFTWARE.

In the past, defense electronics led the commercial world in technology but today defense products are no longer leaders in certain fields. Commercial electronic technology is progressing so fast, for example, that we see obsolescence in personal computers every eighteen to thirty-six months, as compared to a modern sonar/combat system which is expected to last twenty years and probably took ten to twelve years to develop and test.

Recent studies have shown that the hardware/software composition of systems developed in the last ten years is comprised of fewer electronic module types with often as few as ten to fifteen module types comprising an entire system. The amount of effort to design, code and test a computer software has grown dramatically. The cost of software now dominates system development cost.

Modern sonar/combat systems are designed and bought as cabinets complete with military standard electronic modules, cable connectors, and cooling water -- connectors already tested for shock and vibration.

SUGGESTION 5 - Rather than imposing building block standards, like the UYK-44, UYK-43, or the UYS-1 and UYS-2 (EMSP) signal processors on contractors; it makes more sense to standardize on architectures and interfaces like the commercial world has done with the IEEE standards. The way the Navy is envisioning new systems is changing. The Navy's Next Generation Computer Resources (NGCR) program will have the benefit of absorbing new devices or electronic modules

which must only observe interface standards to be quickly applied.

SUGGESTION 6 - The concept of reusable software as a technique for lowering cost becomes more appealing as the software costs grow as a percentage of total development cost. New systems like the Combat Control System MK-2 are designed for rapid reconfiguration which means that an update can be entered quickly and simply. The MK-2 system is also evolving toward an open architecture with much of the processing power residing in militarized commercial workstations.

The reuse of algorithms from the existing combat systems can make the combat system development of the future simpler and less costly.

SUGGESTION 7 - Focus on doing the tradeoffs involved with designing our submarines with equipment compartments and housings for electronic equipment as an integral unit, fully tested for shock and vibration. As an alternative, focus on militarized electronics at the box-level, thus reducing cost and time associated with mil-component requirements. A unified structural approach appears to have advantages in terms of cabling and structural simplification for installation as well as introducing the possibility of more commercial-like electronic modules which could provide large cost savings by encouraging multiple sources of supply.

The suggestion needs to be qualified, however. The issue is one of volume. The major problem will be putting commercial electronics in the available equipment volume with consideration to heat removal.

REDUCE THE COSTS OF ACQUISITION BY REDUCING THE OVERHEAD BURDENS.

The acquisition management of government and industry imposes a financial burden on our products of at least 30 percent according to Malcolm Currie, the Chief Executive of Hughes Aircraft, in a recent Defense News article. This burden occurs without proportionately contributing to the quality of the product. Additionally, the full spectrum of military specifications and standards has caused the technology of our equipment to be obsolete before they are even deployed because of the many steps required in the mandated test programs. A recent check of a RFP (Request for Proposal) showed 6 Mil Specs, 27 Mil Standards, 3 handbooks, and 10 other regulations

relating to cost control and other subjects peripheral to the warfare capabilities of the equipment.

Commonality among platforms is another issue. Four separate organizations in the Navy are developing the next generation anti-submarine warfare equipment for submarines, surface ships, patrol aircraft and surveillance at a large price. Yet there is little commonality among the software parts of these projects, even though it is accepted that software is the biggest part of the cost of development, and has become a large cost driver in the maintenance cost over the lives of the systems.

A third area pertains to the cost of development. We now do research and development to meet a future calendar date instead of a milestone schedule. This leads to "no risk" research and development, an oxymoron. For some reason, we have abandoned prototyping as being too costly.

SUGGESTION 8 - Reexamine our contractor oversight process. To quote Malcolm Currie from the recent Defense News article, "The acquisition system spends entirely too much time and money protecting itself."

SUGGESTION 9 - Coordinate the activities of similar system developments at a reasonable management level to ensure commonality across the software and equipment lines. We used to have a Manager of ASW Projects (MASWPS) that did just that for the ASW community but that office was thrown out with the Navy Material Command bath water.

SUGGESTION 10 - Return to conscientious prototyping and development based on milestone achievements. Let us not be fooled by false cost savings of skipping a prototype phase.

## REDUCE THE COST OF SHORE SUPPORT

The submarine force in the future will be at sea for shorter periods to save operating funds. The cost of maintaining a large training establishment may not be affordable to the Navy.

SUGGESTION 11 - Rethink our training policies with a goal of reducing the long term support costs. Modern communications systems, including satellite links coupled with sophisticated on-board training equipment, should allow realistic training for the individual sailors up through the entire combat team on board the ships, whether at sea or dockside. The shore training establishments should exist to train new sailors and ship crews.

The Navy and industry need to examine these four objectives with a goal of reducing cost while improving performance. At least 30 percent of the program costs tied to acquisition policies could be eliminated without affecting the warfare fighting capability of the equipment. We need to act smarter in designing our new equipment and computer software. The ship manning and training philosophies should be examined to achieve further cost reductions.

The time to start is now. ■

**DOLPHIN SCHOLARSHIP FOUNDATION**
405 Dillingham Boulevard
Norfolk Naval Base
Norfolk, VA 23511
(804) 451-3660

The Dolphin Scholarship Foundation, established in 1961, awards scholarships annually to sons/daughters of members or former members, both officer and enlisted, of the Submarine Force who have qualified in submarines and served in the Submarine Force for at least five years after qualification or served in submarine support activities for a minimum of six years.

Recipients of the Dolphin Scholarship Foundation grants are selected on the basis of scholastic proficiency, non-scholastic activities, all-around ability, and financial need. The selections are made solely on the qualifications of the individual as stated in their application. Scholarships are renewed annually if the student meets the requirements of his or her college.

The applicant must be a graduate of an accredited high school and intend to work, or be working, toward a BA or BS degree. The college chosen by the student must be properly accredited. Candidates eligible to apply can request further information and applications from the address listed above.

!! **APPLICATION DEADLINE: APRIL 15TH** !!

■

# THE SUBMARINE IS THE MOST COST-EFFECTIVE WARSHIP IN *ANY* NAVY.

**A U.S. submarine with cruise missiles has — on a much smaller scale — military characteristics which are a lot like those of a carrier battle group:**

- **can mount an air attack on targets hundreds of miles inland**
- **rapid deployment without basing issues**
- **virtually unstoppable by any nation**

**While the air strike power of the SSN is far less than that of a carrier battle group, the cost is even further less. So, if you don't have enough carriers, send an SSN or two.**

***With SEAWOLF's much greater weapons payload, SEAWOLF's ability to handle larger, longer-range cruise missiles, and with more countries becoming able to attack our carriers with nuclear weapons, the SSN air strike option will become even more important in the late 1990's.***


In the defense
of our nation, there can be
no second best.
716
Newport News
Shipbuilding

## OUR FRIEND, JACK WILLIAMS

*by Don Ulmer*

On the 12th of October, 1991, less than a mile from where the Pacific rolls onto the shores of southwest Washington state, friends and family assembled to honor the memory of Jack Williams. It was his kind of day. Despite forecasted cautions of rain, the sun shone brightly, making it clear that wherever Jack had gone, he was already exerting influence. The rustic seaside community bristled with appointments that nurture quality in its people. It was the sort of place where production of a Jack Williams would be expected. Much of the region's surviving primeval character remained in evidence. Roadside stands of alders, despite lingering summer weather, donned the first traces of autumn splendor, as to honor a departed friend who had passed his early life and final days among them. The opening hymn, Onward Christian Soldiers, with its simplicity and directness, set a perfect tone for the gathering.

We learned of Jack the child and young man from first cousin and boyhood friend, now a clergyman, Father Tom Williams. The two lived next door to each other, Jack being the older by almost a year. Describing early friends with whom they had lived day to day for twelve years, only first names were used. Those who recognized them, it was explained, would know the surnames and those who didn't wouldn't know who they were anyway. This homespun humor, so reminiscent of Jack, evoked the first of many occasions for laughter among a loyal following who crowded the chapel beyond its standing room capacity. The awe and mystique earned by Jack's early teachers were sustained and they were identified by last names, preceded by the mandatory Miss, Mrs. and Mr. prefixes.

Leaders are born, not made, and this quality was very obvious in Jack from the onset. As a young child, he was leader of the "Secret 7," not a very secret group, because if it was, then it wouldn't have been nearly as much fun to be a member. Jack was captain of the eighth grade basketball team, not the best player, mind you, but the captain. He knew the rules better than the high school age officials who would blow their whistles and then Jack stepped forward to explain the call. They won a

lot of games in that manner. A chronic ear infection kept him from playing high school basketball until his senior year. Father Tom then believed this malady would keep *them* from taking Jack at Annapolis, but when confronted with this opinion, Jack simply ignored it and went anyway.

Jack was also captain of the football team and he told all the players what to do.

"He had to come to the bench to tell me what to do," lamented the Father Tom, "because that's where I spent most of my time."

Tones of sadness were in the voice that spoke of Jack's reaching the point where he had to give up being a *natural* leader and leave home to become a *professional* leader. The bittersweet tender years had run their inevitable course, and it was obvious that Jack's gifts of talent and leadership were far too immense to be hoarded by his tiny home town community. Goodbyes were spoken with great reluctance as the cousins and close friends of childhood parted to follow different paths from their first major fork in life's road.

Jack is remembered for having excelled as a leader. He listened to those who differed with him, and so was able to retain their confidence. To this, he blended a truly remarkable sense of humor which further strengthened Jack's performance of his inevitable leadership roles.

Jack confided to Father Tom at a recent family picnic that he did not want to die. He accepted it, but reluctantly. There remained a great many things he wanted to do, and by Jack's perception, many debts he believed still owed.

Father Tom regretted not being able to live near Jack as an adult, but declared that all our paths, regardless of when they had crossed with Jack's, caused us to be in some way affected by him. Later a poem would be read which includes verses that summarize his attitudes about life and his passing from it. Jack's time was adorned with many friends, the best among them, his wife Dorothy, but many, many friends. When Father Tom last spoke with him, Jack had revealed his peace with God, country and self. The eulogy concluded with an expression of gratitude for all that had been done by a very close cousin and childhood friend, Jack Williams. Father Tom earned gratitude and respect from those who had not known Jack in the early years, for indeed the dissertation was difficult for one who had

so loved his cousin.

Dan Cooper spoke of the Navyman, Submariner and Admiral, and gave a splendid account of what Jack had done with his time away from his fellow townspeople. Dan fell naturally into the homespun mode set previously, and his warm message was not obscured in Navy jargon. Jack was no different from what had been earlier said of him. His success brought no pretenses nor airs. He was always himself, just as we all have come to know him. Jack touched and changed many lives. He was smart, professional and enthusiastic, and was blessed with a penchant for naturally doing the right thing.

Dan was a young officer on the attack submarine HADDO, while it was commanded by Jack. During a port visit at Ft. Lauderdale, Florida, Dan had planned a trip to see his 80 year old grandmother in Lake Worth, 90 miles away. Taxi fare would be paid out for the 2 hour ride to Lake Worth, a 2 hour wait, and then 2 hours for the ride back. A local citizen, Bob, chanced to visit HADDO. Jack related the story of Dan's plan and asked whether anything could be done. Bob stammered something about loaning his personal car. Scarcely were the words spoken when Jack roared out what a splendid idea this was. Somewhat flustered, Bob delivered on his promise, but was never quite the same again.

Another anecdote was on Jack's sense of knowing when rules should be *bent*. Ballistic missile submarine movements were never discussed, but it seemed always on the eve of Dan's return to port, a certain Navy captain would arrive at his home and conduct an impromptu white glove inspection to alert Dan's wife of the impending visit of a very important person. This sort of thing typified why so many considered Jack to be a very special person.

Admiral Jack Williams had three submarine commands, commanded a submarine squadron in Rota, Spain, and was Chief of the Navy Section of Joint U.S. Military Mission for Aid to Turkey at Ankara, Turkey. He might be the only person to have been selected for flag rank and become father of a new son in the same month. He rose to the rank of full Admiral and became the Chief of Naval Material, where he led the organization responsible for making all purchases enacted by the Navy. Many who worked for Jack Williams did quite well in their careers, a goodly number being promoted to Admiral. All

have been profoundly affected by Admiral Jack. Dan said that apart from his wife and father, Jack had exerted greater influence on him than anyone.

An American Flag which had flown over two of the places considered by Jack to be the most important to him in his home state of Washington, the Submarine Base, Bangor and the Naval Undersea Museum Foundation, Keyport, was presented to his widow, Dorothy.

A second clergyman eulogizer spoke of the Navy man returned home. Jack could always talk you into doing something you really didn't want to do and you would end up being glad you did it. A significant number of heads among the congregation signaled personal experience in this regard by nodding in the affirmative.

The speaker told of once being concerned over whether the stature of a local *Loyalty Day* parade was sufficient to bring a Navy Admiral to be its Grand Marshall. He learned later that it was the stature of the man that brought the Admiral to the parade.

School bond issues were being voted down and then Jack became Chairman of the School Board. Tireless efforts on his part resulted in better definition of the efforts needed and the direction in which they should be applied. Through the magic of his leadership, an effective consensus was reached and the school situation improved remarkably.

As evidenced by the row of Boy Scouts in the congregation, Jack had given them great support. Some were embarrassed at the first Scout meeting when after asking Jack to attend, only one boy showed up. Not at all flustered, Jack worked with the lad, focusing on what was needed for the youngster to advance in rating. Word spread and the next meeting was substantially better attended, thus Boy Scout Troop 28 grew because of him. On a scout campout, despite having recently undergone knee surgery, Jack knelt among the boys and helped them to scrub a facility they had been permitted to use. The place was left in much better condition than it was found, Jack made the time to speak at courts of honor for two of the boys who made Eagle Scout.

He was extremely successful in founding the Pacific Northwest Chapter of the U.S. Naval Submarine League, but, much earlier in Jack's life, a tryout for the church choir resulted quite

differently. At the conclusion of his audition, the choir director, diplomatically as possible, discussed the church's urgent need for Sunday School teachers. Jack also knew how to follow, for this quality is the very foundation of the sound leadership he universally provided. And so he became an outstanding Sunday School teacher.

Death turns us to God instinctively. It brings about a coming together for reassurance, hence so many have gathered because they care. The journey of self on earth is done and the post-life voyage begins for Jack. Let all go forward and remember. Let all be thankful for the goodness and truth passed on by our good friend to so many others.

Voices were joined in the Navy Hymn, followed by a recitation of Alfred Lord Tennyson's poem, Crossing the Bar. The final stanza summarized perfectly what result would come from the manner in which Jack had directed his life "...I hope to see my Pilot face to face, when I have crossed the bar."

Dorothy and family did husband, father and our friend proud as they greeted each who had come to the memorial service, many from very long distances. Jack was special because he always made everyone feel special, and the aura of his presence was very much sensed. Almost at anytime it seemed his great voice would boom out your name, and declare how good it is to see you. Alas, it did not. Its music is lost to us forever, but not the memory of Jack Williams, and the value he added to the many lives so fortunate to have him be a part of them. ■

**IN REMEMBRANCE**

*Admiral John G. Williams, Jr., USN(Ret.)*
*(Founder and first President of the*
*NSL Pacific Northwest Chapter)*

*Vice Admiral Robert L. Walters, USN(Ret.)*

*Captain Louis H. Roddis, Jr., USN(Ret.)*

## HISTORY OF SUBMARINE SQUADRON FOURTEEN

*by Captain Ronald D. Gumbert, USN*
*Commander, Submarine Squadron FOURTEEN*

*A ceremony to mark the stand down of the U.S. Navy in Holy Loch will be held on 21 February 1992 at 1400 in Queen's Hall in Dunoon. Several U.S. Navy, Royal Navy, U.S. and U.K. government officials have been invited to the event which will commemorate the passing of an historical era.*

The establishment of Submarine Squadron Fourteen as a deployed Fleet Ballistic Missile submarine refit squadron was an essential element of the Polaris missile program. On 1 July 1958, the squadron was established in Washington, DC. Under the command of Captain Norvell G. Ward, the squadron staff worked with the Office of the Chief of Naval Operations in transforming the Fleet Ballistic Missile submarine concept into reality.

The first 20 months were devoted to the development of doctrine and procedures governing the operations of the nuclear-powered fleet ballistic missile submarine (SSBN). From these deliberations emerged the two crew (Blue/Gold) manning concept to maximize the amount of time the submarine would spend at sea, and the scientific and logistics support framework that supported the Polaris/Poseidon systems and serve today to support the Trident Class weapons system.

Concurrent with the establishment of Squadron Fourteen, the original hull for USS SCORPION (SSN-589), under construction at Electric Boat Shipbuilding Company at Groton, Connecticut, was cut in half and a compartment with 16 Polaris missile tubes was installed. Thus, the first Fleet Ballistic Missile submarine, USS GEORGE WASHINGTON (SSBN-598).

Limited by an effective missile range of 1,200 nautical miles, it was necessary to locate the submarine refit site at an overseas location within a reasonable transit time of assigned patrol areas. Therefore, in the autumn of 1959, the United States approached the government of the United Kingdom with a request for support of the U.S. Navy's first SSBN squadron. In July 1960, Holy Loch, Scotland was selected as FBM Refit Site One. Located on the Firth of Clyde, the site had been the location of a Royal Navy Submarine Base in World War II.

Today, its location is adjacent to the Royal Navy's new Trident Facilities at Coulport and Faslane.

As the Submarine Fleet Ballistic Missile program became more clearly defined, Submarine Squadron Fourteen moved to Norfolk, Virginia, and USS REDFIN (SS-272) became the first operational submarine to join the squadron, assigned to assist in the development and refinement of navigational techniques. Gradually, the squadron assumed a more direct role in the daily material and personnel aspects of Polaris operations. The culmination of the first two years of the Squadron's existence occurred on 20 July 1960, when USS GEORGE WASHINGTON successfully conducted the first undersea launch of a Polaris missile. In September 1960, Captain Ward moved the Squadron to New London, Connecticut in preparation for the first SSBN deployment. On 15 November 1960, USS GEORGE WASHINGTON deployed on the first submarine strategic missile patrol.

Concurrent with the development of the SSBN was the development of support activities including the conversion of USS PROTEUS (AS-19) into a Polaris support tender. The preparation of a *mobile support base* ensured that equipment and skilled personnel would be available to conduct required repairs at an overseas refit site, anywhere in the world.

On 3 March 1961, USS PROTEUS, with Commodore Ward embarked, arrived in Holy Loch, Scotland, establishing Submarine Fleet Ballistic Missile Refit Site One. Five days later, USS PATRICK HENRY (SSBN-599), the second SSBN to deploy on a Polaris A-1 patrol, arrived to commence the first refit at the Holy Loch. On 1 June 1961 the four sections of USS LOS ALAMOS (AFDB-7) arrived and a 500-man crew of Mobile Construction Battalion Four labored for the next 5 months to assemble the craft. In November 1961, USS LOS ALAMOS (AFDB-7) commenced more than 30 years of continuous service to SSBNs, SSNs and other visiting Fleet units at Refit Site One.

A strong emphasis on mobility would remain a characteristic throughout the existence of Submarine Squadron Fourteen. The tender was anchored or moored in the middle of the Holy Loch, with access provided only by small boat. Although accommodations would eventually be made for the provision of potable water and telephones; electrical power would be provided 24 hours a day, 365 days a year by the tender, or in

the tender's absence, the drydock, an arrangement that would remain unique in the Submarine Force.

In March 1963, the first change of deployed tenders occurred when USS HUNLEY (AS-31) relieved USS PROTEUS as the Submarine Squadron Fourteen tender. By the end of 1963, Submarine Squadron Fourteen had reached its full operational strength of 10 SSBNs, a large floating drydock and a submarine tender.

On 2 June, 1964, GEORGE WASHINGTON departed Holy Loch on her last patrol prior to returning to the U.S. for overhaul and conversion to the Polaris A-3 missile system. NATICK (YTB-760) joined the squadron on 31 July 1964, assisting with arrivals, departures, and berth shifts. Also during July, USS SAM HOUSTON (SSBN-609) completed the 100th Polaris strategic deterrent patrol.

With the arrival of USS JOHN ADAMS (SSBN-620) in January 1965, USS HUNLEY was then required to perform refits on three classes of submarines (598, 608 and 616). In addition, in August 1965, HUNLEY received the A-3 missile, this marking the first time a tender simultaneously carried all three Polaris missiles. Later that same month, ABRAHAM LINCOLN departed on the final Polaris A-1 patrol, also closing out the SSBN-598 class's initial deployment cycle. At the end of the year, HUNLEY marked her 100th SSBN refit when USS THOMAS A. EDISON (SSBN-610) commenced an upkeep alongside.

In April 1966, SAUGUS (YTB-780) arrived from Rota, Spain, to serve as the Squadron's second tug. Three months later, USS SIMON LAKE (AS-33) commenced turnover as the supporting submarine tender. On 28 September 1966, USS GEORGE BANCROFT (SSBN-643) became the first 640 class submarine to undergo refits in Scotland.

For the next four years, as the level of conflict in Southwest Asia escalated, Refit Site One continued to conduct a nominal 36 refits a year in support of the strategic defense of the United States and the free world. USS LOS ALAMOS spent all of 1969 in overhaul at Scott-Lithgow shipyard in near-by Port Glasgow, returning to the Squadron in January 1970. As the yard period had disrupted her six submarines-a-year docking schedule, she drydocked 10 submarines in the first four months of 1970 to restore the submarine drydocking schedule to

normal.

The fourth submarine tender to serve at Holy Loch was USS CANOPUS (AS-34), fresh from a conversion overhaul at Puget Sound Naval Shipyard where she became the first tender configured to support the Poseidon C-3 missile system. By 1970, Submarine Squadron Fourteen consisted of 14 SSBNs, a submarine tender, a large floating drydock, two tugs, a 100-ton floating crane, one YNFB and 20 small craft.

In 1971, the mooring of the tender, drydock and YNFB was changed. The new arrangement had the stern of the tender moored to the stern of the YNFB and the bow of the YNFB moored to the bow of the drydock. Under this revised mooring plan, submarine and tender personnel were able to walk from the tender to the drydock without taking a small boat. This greatly improved efficiency and productivity.

In 1972, Submarine Squadron Fourteen transitioned to an all 627 class Poseidon-converted submarine squadron. On 19 May 1972, USS JOHN CALHOUN (SSBN-630) returned to Holy Loch after completing the 1,000th strategic deterrent patrol.

The rapid construction of the 41 nuclear powered fleet ballistic missile submarines in the 1960s, combined with the 594 and 637 class SSNs, resulted in a large number of submarines requiring overhauls in the 1970s. As part of the innovative procedures developed to extend the operation cycle of the Fleet Ballistic Missile submarine, the Ship's System Maintenance Monitoring (SSMS) program was instituted in 1972. This program, designed to identify shipboard components requiring repair before they failed, set up its first monitoring team in Holy Loch. In addition, in order to extend the period between shipyard overhauls, the Extended Refit Program (ERP) was initiated. USS JAMES MADISON (SSBN-627) conducted the Squadron's first ERP between September and November 1974. With the completion of the ERP drydocking availability, LOS ALAMOS, with the assistance of the Philadelphia Naval Shipyard, initiated a self-overhaul. The overhaul provided the drydock with additional capabilities to help support future ERPs. During the overhaul, four diesel engines were removed from two pontoons, returned by air freight to the U.S. and refurbished and installed in two replacement pontoon sections. These refurbished pontoons were then towed to Scotland and replaced two of the four operational pontoon sections.

In 1975, Refit Site One completed two more ERPs. In recognition of the superb performance during these first three extended refits at the deployed site, Submarine Squadron Fourteen was awarded the Meritorious Unit Commendation. In November 1975, USS HOLLAND (AS-32) relieved USS CANOPUS as the fourth tender in the Holy Loch, and CANOPUS returned to Charleston. In 1976, PIQUA (YTB-793) arrived in Holy Loch, providing the third tug to assist with Site operations.

The late 1970s and early 1980s were marked by increased operating tempo and increasing complexity in material maintenance. The first steam generator inspection to be accomplished at an advanced refit site was conducted in 1976. During the following years, two steam generator inspections and two ERPs became the normal workload; along with three SSBN refits, a TAK visit and, on average, one SSN upkeep per month.

In 1981, LOS ALAMOS completed a major overhaul of her wingwalls. The work included shifting the drydock's boilers 90 degrees to permit better maintenance accessibility and improved space utilization. This year also marked the 20th anniversary of the establishment of Refit Site One. On 29 March 1981, a banquet was held in Dunoon for many past and present members of the Squadron and for many citizens of the local Scottish community.

On 11 November 1981, USS OHIO (SSBN-728) was commissioned at Groton, Connecticut. With the commencement of operations of the Trident weapons system, and the establishment of the refit sites at Bangor, Washington, and Kings Bay, Georgia, the years of the Polaris/Poseidon weapons system were clearly numbered. However, there remained many years before the planned 24 Trident Class SSBNs would be completed and Submarine Squadron Fourteen continued its daily business of refitting submarines for strategic deterrent patrols.

On 25 January 1982, USS HUNLEY (AS-31) returned to Holy Loch for her second tour as the Submarine Squadron Fourteen tender. Members of the Squadron, tender, and drydock continued to support a multitude of community functions and organizations.

On 8 March 1986, a gala 25th anniversary celebration was held at Queen's Hall in Dunoon. In commemoration of that occasion, a ceremonial cairn and 25th year Submarine Squadron

Fourteen commemorative plaque were dedicated at Castle Gardens. This occasion, attended by numerous U.S. and Royal Navy officials and by many Scottish dignitaries, celebrated the continuing harmonious relationship between the United States and the United Kingdom. In June 1987, Submarine Refit Site One received the United Kingdom's Ambassador's Award for Community Relations for calendar year 1986. The following year, the Squadron was the recipient of a special Ambassador's Award for its strong community service to the residents of the Cowal Peninsula.

On 7 June 1987, USS SIMON LAKE relieved USS HUNLEY for what was destined to be the last tender turnover. As part of the Navy's continuing goal to be a valued member of the local community, the SIMON LAKE's Repair department prepared a copy of a bust of General Dwight D. Eisenhower to commemorate the 100th anniversary of his birth. This superb casting was presented to the Scottish National Trust and is now on display at Culzean Castle in southern Scotland, Eisenhower's headquarters during WW II. The castle is now a museum. On 8 August 1991, USS WILL ROGERS (SSBN-659) completed the last submarine drydocking at Site One. On 23 September 1991, LOS ALAMOS completed her last undocking evolution when she undocked the YNFB-42 and YD-245 which were in an availability prior to their transfer to COMSUBRON TWENTY-TWO in La Maddalena, Sardinia.

The U.S. Navy facilities at Holy Loch, both Submarine Squadron Fourteen and the Naval Support Activity, will be disestablished by 1 June 1992. In February 1992, LOS ALAMOS will depart Scotland for the first time in 31 years, and on 3 March 1992, SIMON LAKE will weigh anchor for her return to the United States. On that day, for the first time since 3 March 1961, the flag of Commander, Submarine Squadron Fourteen will no longer fly over the Holy Loch. For all the men and women who served at Refit Site One, an era will have ended. But for those active duty and dependent personnel, who were fortunate enough to have served in the Highlands, the warmth and friendships established over three decades with our Scottish neighbors will always remain.

## Former Submarine Squadron Fourteen Commanders

CAPT Norvell G. Ward, USN
1 July 1958 - 25 August 1961

CAPT Walter F. Schlech, USN
25 August 1961 - 23 November 1962

CAPT David B. Bell, USN
23 November 1962 - 6 July 1964

CAPT L. S. Eubanks, USN
6 July 1964 - 8 November 1966

CAPT Reuben F. Woodall, USN
8 November 1966 - 27 July 1968

CAPT Benjamin F. Sherman, Jr., USN
27 July 1968 - 13 July 1970

CAPT Frank D. McMullen, Jr., USN
13 July 1970 - 18 June 1971

CAPT Paul J. Early, USN
18 June 1971 - 18 July 1972

CAPT Albert L. Kelln, USN
18 July 1972 - 18 January 1974

CAPT James R. Lewis, USN
18 January 1974 - 19 June 1976

CAPT Stanley G. Casola, USN
19 June 1976 - 19 October 1978

CAPT William D. Smith, USN
19 October 1978 - 14 June 1980

CAPT Guy H. Curtis, USN
14 June 1980 - 15 July 1981

CAPT James N. Adkins, Jr., USN
15 July 1981 - 10 May 1983

CAPT George W. Davis, VI, USN
10 May 1983 - 19 April 1985

CAPT David M. Goebel, USN
19 April 1985 - 27 August 1987

CAPT Edison L. Watkins, III, USN
27 August 1987 - 13 May 1989

CAPT Fred P. Gustavson, USN
13 May 1989 - 3 May 1991

CAPT Ronald D. Gumbert, USN
3 May 1991 -

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**MEMBERSHIP STATUS**

| | Current | Last Review | Year Ago |
|---|---|---|---|
| Active Duty | 1010 | 1004 | 988 |
| Others | 2767 | 2771 | 2853 |
| Life | 230 | 230 | 211 |
| Student | 28 | 28 | 26 |
| Foreign | 74 | 72 | 73 |
| Honorary | 23 | 23 | 25 |
| Total | 4132 | 4128 | 4176 |

**PLEASE RECRUIT 2 NEW MEMBERS FOR 1992!**

## ON PATROL FIFTY YEARS AGO

*by Dr. Gary E. Weir*

*On 19 November 1941, the USS TRITON (SS-201) and the USS TAMBOR (SS-198) left Pearl Harbor together under orders from COMSUBPAC to conduct war patrols in the vicinity of Wake Island. The officers and men on board these two submarines left behind a peaceful world they would not experience again for many years. During the course of their activities near Wake, the United States formally entered World War II with the Japanese attack on Pearl Harbor and both vessels, along with the entire Pacific Fleet, found themselves caught up in the confusion of the opening days of the war.*

*For TRITON, and her commanding officer, Lieutenant Commander W. A. Lent, this first patrol of the war brought a wide variety of challenges. While coping with numerous mechanical difficulties plaguing his ship, Lent and his crew engaged in one of the first submarine-destroyer engagements of the war. He also successfully evaded a post attack search by a Japanese destroyer and took measure of the damage done to the facilities and defenses on Wake Island before returning to Pearl Harbor. This is what it was like on the front line as the war began for American submarines in the Pacific.*

### USS TRITON

**NARRATIVE:** **January 3, 1942**

In accordance with COMTASKFORCE 7 Operation Order 28-41, this vessel in company with USS TAMBOR departed Pearl Harbor November 19, 1941, to conduct War Patrol in the vicinity of Wake Island. Both vessels proceeded on the surface enroute except for a trim dive and one dive to escape detection by a ship. At 2335 *[Ed. Note: All times are GMT]* on November 21, 1941, sighted the mast of a ship bearing about 320°T. TAMBOR was notified and dived on the base course. TRITON dived on base course and TAMBOR proceeded to investigate ship. At 1000 November 26, 1941, passed reference point "LL", 90 miles from Wake and proceeded independently to patrol station arriving in area about 1700 and diving to commence submerged patrol during daylight hours. After

surfacing that evening TRITON exchanged calls with signal station of local defense battalion and informed the station that TAMBOR and TRITON had taken area from the NARWHAL and DOLPHIN. Message was also received that no planes were operating from the island.

The patrol during the period through 1200 December 6, 1941, was routine and uneventful. While submerged, TRITON closed the island to a distance of about two miles at least once daily and steered various courses keeping in sight of the island.

At the request of the Commanding Officer of the N.A.S. and the Commanding Officer of the Marine Defense Battalion, the Commanding Officer visited Wake on December 6, 1941, for a conference. The general situation was discussed, plans for patrol by fighter planes were covered. Plans for periscope detection drill by planes were made and the Commanding Officer was informed of plans for test firing of the defense battery at Peacock Point. It was also learned that no patrol planes were due to base from Wake for at least a week.

At 0145 December 8, 1941, noted two large columns of whitish smoke on Wake and proceeded to close the island for a better view. At 0900 noted an additional column of black smoke. At 0400 from a position about two miles off shore observed dredges working and assumed smoke was from fires on the island. No signal was heard from Wake on the periscope antenna during this time. Upon surfacing that night heard news broadcast of raid on Pearl Harbor, Midway and Manila. At 0800 Wake signaled by searchlight that war was on and for TRITON to keep clear of gun range. A message stating they had also been bombed during the afternoon was given us. That night the shore batteries held practice firing and upon completion the island was blacked out about 1030. TRITON completed stripping ship insofar as practicable and made preparations for action.

At 0040 December 9, 1941, sighted columns of smoke and flame from bomb hits on Wake. Since Wake was not on the air when TRITON surfaced, sent report of bombing to CINCPAC. Wake came back on the air about 1200.

The night of December 10, 1941, while TRITON was patrolling on the surface on course 045°(T) speed 4 knots and charging batteries on the finishing rate, about 10 miles from Wake the lookout at 1215 sighted two flashes and then the

shape of a destroyer or cruiser against the back ground of a heavy cloud, abaft the port beam. The ship was on a parallel course but changed toward the TRITON. The TRITON was silhouetted against the moon which had risen about a half hour previously. The officer-of-the-deck estimated the range at 6,000 yards and thought the ship looked large for a destroyer. He immediately cleared the bridge and dived the ship. The diving time was slow as the seas were heavy and on the starboard bow and course had to be changed toward the enemy to get under. Upon levelling off heard the enemy ship on the starboard side and assumed it had passed ahead. Enemy was endeavoring to track TRITON by sound as propeller beats were alternately fast and stopped. TRITON started evasive tactics.

At 1317 with the enemy ship evidently trailing at slow speed, on steady bearing and a considerable distance astern, planed up to 120 feet and fired a salvo of four torpedoes from the stern tubes:

Firing Times

No. 7 tube - - - 13-17-00
No. 8 tube - - - 13-17-08
No. 9 tube - - - 13-17-20
No. 10 tube - - - 13-17-38

At 13-17-58 heard a swishing noise in the sound gear and a dull explosion was heard and felt throughout the ship indicating a probable hit by one torpedo. At about the same time the enemy propeller speed became fast for about a minute and then stopped, not to be heard again. TRITON went to 175 feet and ran silent clearing the vicinity. Some time later, the time was not recorded, heard high speed propellers but vessel did not come close. At 1610 heard two probable depth charge explosions seemingly well astern. At 1905 heard two very loud explosions which seemed fairly close. During the interval between 1610 and 1905 several light explosions were heard. At 1947 came to periscope depth and nothing could be seen. At 2025 heard distant explosions, and at 2043 felt two violent explosions not far away and went to deep submergence for some time. Closed the island to a distance of about two miles but sighted no vessels in the vicinity. At 0520 December 11, 1941, heard possible propeller sounds on sound gear at 350°(T) and drawing across the bow. Planed up to periscope depth and

swept the horizon but nothing was seen and noises were unidentified. At 0709 surfaced after 18-3/4 hours dive. Later report was heard on radio news program that the marines had sunk a light cruiser and destroyer South of Midway.

December 12 and 13 were uneventful except that at 1638 on the latter date, distinct flashes in the vicinity of Wake probably from gunfire were seen. Upon closing the island after dawn no ships were sighted.

December 14 and 15 were uneventful except that a plane which looked like a PBY was sighted over the island at 0120 on the 15th.

On the 16th about 0200 several explosions were heard and it was noted that Wake was being heavily bombed again and several large fires were set including the large fuel tanks at Contractors Camp #1.

At 1030 on the 16th received a plain language radio message from Wake to search South of Kupu Point. After running in to within 3 miles of Kupu Point changed course to 120°(T) to parallel the shore line and searched the area toward the island. Anything on the surface in the vicinity would have been silhouetted against the light of the large fires on the island. Nothing was sighted. During the night received orders from COMTASKFORCE 7 to patrol all of area 27 due to departure of TAMBOR for Pearl.

At 2343 on December 18, 1941, heard a series of violent explosions followed by loud water noises probably caused by a stick of bombs in water not far away.

At 0620 on December 19, 1941, passed through a considerable oil slick, heard strange noises in sound gear that may have been air bubbling to surface. Position at this time was about 10 miles bearing 155°(T) from Peacock Point.

On December 19, 1941, three times during the day suspected propeller noises were heard on the JK. On the third contact these sounds were heard over a period of twenty minutes. Nothing was sighted on the surface. Upon surfacing sent radio report to CINCPAC to the effect that an enemy submarine was believed to be in the area.

At 0043 December 21, 1941, picked up definite propeller noises on the JK. Nothing was in sight, so assumed it to be an enemy submarine. Maintained sound contact until 0119. During this interval the propeller speed changed several times,

speed varying from 129 to 160 r.p.m. and also stopped for short intervals. At 0121 heard heavy prolonged explosion not far distant followed by considerable water noise. Propeller sounds increased in speed and shortly thereafter were lost. Later intercepted report from Wake that they had been bombed by 17 planes at 0121. Explosions heard were probably a stick of bombs dropped in the water. At 0930 received dispatch from COMTASKFORCE 7 directing return to Pearl. At 0958 proceeded on course 000°(T) clearing the area enroute to Pearl via a point latitude 23° N and to the north of Wake. At 1809 dived and ran submerged during daylight hours due to close proximity to Wake and possible enemy units. On December 23, 1941, attempted to run on the surface during daylight but at 0527 sighted an unidentified plane crossing astern and heading into the stern. TRITON dived at once but bow planes stuck in a partially rigged out position and dive was continued controlling the ship by the stern planes and adjusting speed. The ship was levelled off at 110 feet. Bow planes were back in commission at 0537. At 0615 believed sighted plane circling in clouds to southward, went to deep submergence, changed course and speeded up to clear the vicinity in case of search by surface vessels. At 0723 shortly before time intended to surface, heard suspicious noises on JK, approximate position at this time latitude 25-36 N., longitude 167-41 E. As sounds became louder picked up the propellers of two vessels. Went ahead dead slow, stopped all unnecessary auxiliaries, prepared for depth charging and continued to clear the area. At 1830 lost sound contact. Previously heard what were probably supersonic pings several times but at no time were searching vessels close to TRITON. The propeller sounds were distinctly not those of friendly destroyers. At 0930 surfaced and proceeded toward Pearl. Enroute Pearl the ship was forced down several times by unidentified planes, all probably friendly as we had been informed of a task force containing one carrier operating in our vicinity.

At 1306 December 30, 1941, sighted a ship bearing 340° and proceeded to investigate. Closed to about 4,000 yards and tentatively identified vessel as USS WRIGHT with a destroyer ahead on approximate course 120°, speed about 6 knots. Made challenge twice to WRIGHT and twice to destroyer. Neither vessel answered. TRITON continued to trail these vessels and

about 1345 repeated the challenge by blinker tube. Again neither vessel replied. Being quite sure of the identity of the WRIGHT and having been informed that she was operating in the vicinity, the Commanding Officer decided to withdraw without further challenging and the TRITON proceeded on the course for the rendezvous with the USS LITCHFIELD at daybreak. Because of the failure of the gyro compass that evening and the inability to get star sights in the morning, the TRITON's position was considerably in error and difficulty was experienced locating the LITCHFIELD. At 2135 sighted the LITCHFIELD and set course for Pearl. Moored alongside USS PELIAS at Submarine Base at 0644 December 31, 1941.

**SUMMARY HIGHLIGHTS:**

Only one enemy vessel was sighted. An accurate description cannot be given but from the report of the officer-of-the-deck and lookout, the Commanding Officer is of the opinion it was a single stack light cruiser.

No aircraft were sighted at close enough quarters to permit identification except the PBY planes seen flying over Wake early in the patrol period.

**ONE ATTACK:**

Fired 4 torpedoes from tubes 7, 8, 9, and 10. Sound Shot, point of aim propellers. Estimated course 320°; estimated speed 3 knots; Estimated range 1500.

| | Firing Time | Gyro Angle | Track Angle |
|---|---|---|---|
| No. 1 | 0$^{m}$ - 00$^{s}$ | 15-1/2° R | 16° Stbd. |
| No. 2 | 0 08 | 18° R | 18° Stbd. |
| No. 3 | 0 20 | 21° R | 21° Stbd. |
| No. 4 | 0 38 | 33-1/2° R | 24° Stbd. |

Spread angle 2°

**ENEMY A/S MEASURES:**

The enemy vessel encountered on the night of December 10, 1941, did not appear to have supersonic equipment but appeared to be endeavoring to track the TRITON by listening as she stopped her screws frequently for short periods.

The vessels heard on December 23, 1941, while submerged, are believed to have had supersonic ranging equipment but contact was not maintained long enough to be positive about it.

No close range depth charge attacks were made on the

**MAJOR DEFECTS EXPERIENCED:**

The only major defect experienced was damage to the lower packing gland of No.2 periscope. This casualty was caused by building up excessive grease pressure in the bearing while greasing with a pneumatic gun. Evidently packing had been jammed between the gland and periscope so that excess grease could not escape. The gland was badly sprung and adjusting studs bent.

The gyro compass failed the night before arrival at Pearl Harbor and the trouble was not located until after ship was tied up at the Base.

Sparking of engine exhausts was a constant source of concern. Some type of wet exhaust should be installed before the next patrol. This is a very serious military deficiency.

No other serious defects were experienced.

**POTABLE AND BATTERY WATER;**

The potable water situation was one of the chief causes of concern during the entire time on station. The tank capacity and type distillers installed in this class submarine are simply not adequate. It is sincerely hoped that the installation of the electric stills will correct this condition. Potable water consumption the last two weeks on station was cut to an average of about 275 gallons per day by closing off the washrooms entirely and using this water only for cooking, drinking, making battery water, and washing dishes.

The condensate from the airconditioning system was chlorinated and used for washing of person and clothing. In addition to the installation of stills it is believed that an additional wash water tank should be built into these vessels similar to those on both the older and newer classes of submarines. This vessel started on patrol with wash water stored in forward trim tank. Had it been necessary to reload the forward tubes this water would have been contaminated when the tubes were blown dry. While enroute to and from patrol stations the water making capacity of the distilling plant was more than ample to take care of any demands on the fresh water supply. No difficulty was experienced with battery water. Consumption was carefully watched and maintained at between 45-50 gallons per day by control of ventilation and charging. Potable water was distilled for battery water entirely. Prior to the next patrol

it is planned to pipe the air conditioning condensate to the engine room for redistilling for battery water.

**GENERAL:**

Undoubtedly the experience gained on this patrol will be invaluable on future trips. Diving and running submerged is routine and many feel more relaxed submerged than when on the surface at night. Getting accustomed to the strange noises we were subjected to while submerged was quite difficult. Some of them were very disconcerting, to say the least, especially when the source was unknown.

It is considered that, with the fresh water situation improved, the limiting endurance factor on a war patrol will be personnel. The endurance of personnel will be affected by several factors including time on station, type of patrol, weather conditions encountered and general health at the start of the patrol.

LCDR *W. A. Lent, USN*
*Commanding Officer, USS TRITON*

**REAR ADMIRAL WILLIS ASHFORD LENT, USN(RET.)**
(Deceased)

Willis Ashford Lent was born on January 5, 1904, in Dorchester, Massachusetts, the son of John A. Lent and Mrs. Burdette Hebb Lent. He attended the Dedham (Massachusetts) High School prior to his appointment to the U.S. Naval Academy at Annapolis, Maryland, from the Eleventh District of his native state in 1921. Graduated and commissioned Ensign on June 4, 1925, he advanced progressively in grade to that of Captain to date from July 20, 1943. On June 30, 1955, he was advanced to Rear Admiral on the Retired List of the Navy on the basis of combat awards. Rear Admiral Lent died at the Naval Station Hospital, Submarine Base, New London, Connecticut, on August 28, 1959. He is buried in the Arlington National Cemetery.

In addition to the Navy Cross with Gold Star, and the Legion of Merit, Rear Admiral Lent received the Second Nicaraguan Campaign Medal; the American Defense Medal, Fleet Clasp; the Asiatic-Pacific Campaign Medal; and the World War II Victory Medal.

He was married to the former Eleanor Gallivan of Dedham, Massachusetts, his children being Willis A. Lent, Jr., born 10 August 1931 and John G. Lent, born 1 July 1939.

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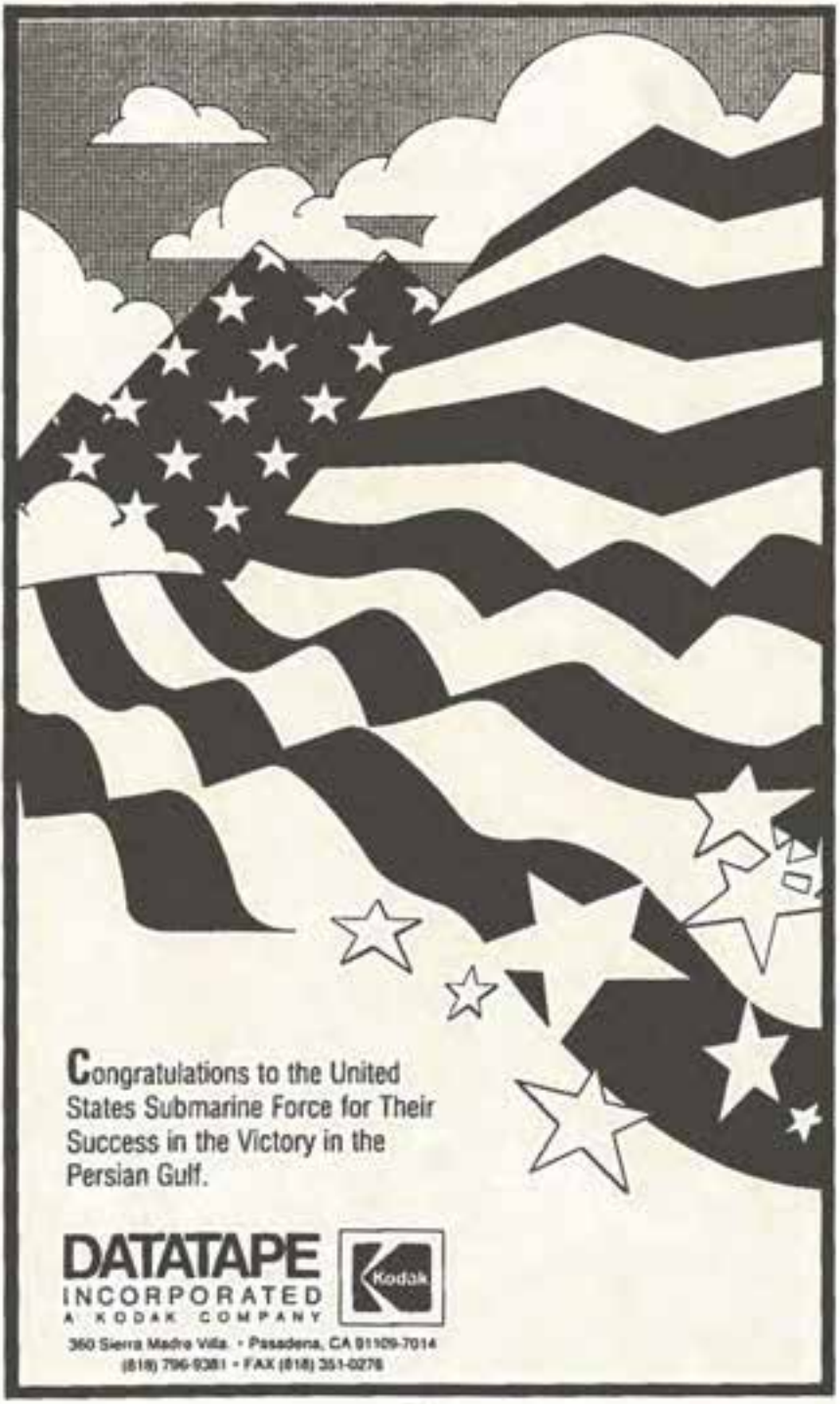
Congratulations to the United States Submarine Force for Their Success in the Victory in the Persian Gulf.
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## THE CASE FOR A SUBMARINE-BASED ANTI-SATELLITE SYSTEM

I would like to thank you for publishing Richard Thompson's response (**THE SUBMARINE REVIEW**, July 1991) to my January article on the submarine-based anti-satellite system. I feel responses such as his provide an impetus for further thought and discussion. As a matter of completeness, however, I would like to respond to Mr. Thompson's concerns.

Although I often refer to various companies by name in the following discussion, it is only for historical purposes.

(1) The original concept for a submarine-based interceptor system was proposed to SDIO (Strategic Defense Initiative Office) in November 1986 by the Rocketdyne Division of Rockwell International. The earliest concept was known as HYVINT, for HYperVelocity INTerceptor, used in a strategic anti-ballistic missile (ABM) role. This was followed by a briefing in 1987 to the Center for Naval Analysis and the office of the Chief of Naval Operations. A modified Trident 726-class with a 196 missile loadout, and a lengthened SSN-21 with 60 missiles, were suggested as platform options. The advantage of the approach was forward-basing providing boost-phase intercept, and the survivability and mobility provided by a submarine.

In February 1988, the anti-satellite system was proposed by Rockwell to the Navy's Naval Surface Weapons Center (NSWC) and Strategic System Program Office (SSPO). It was a natural extension of the concept, relying on the same technology. Compared to the ABM, the ASAT mission had the advantages of less stressing timelines and fewer engagements, which made it ideal for deployment on a space-limited attack submarine.

(2) I remember the Proceedings article Mr. Thompson refers to about sea-based antipode basing. However, it is ironic that he mentions General Dynamics as the first to publish the idea because Rocketdyne briefed it as part of the submarine-based interceptor program to Gerald Cann (then Vice President of General Dynamics' Undersea Warfare Center and now Assistant Secretary of the Navy for Research, Development, and Acquisition) and John Shilling (Director of Programs) in July 1988. To support the brief, I did the operations analysis and

addressed missile-launch tube interface issues. GD, however, was not interested in a teaming agreement. This was unfortunate because later, when the Defense Acquisition Board (DAB) decided to give the program to the Army, rather than the Navy, Rockwell was selected as the system's sole contractor, including system integration. There was a rumor of GD filing a protest, but nothing resulted. It is interesting to note that only recently *(Inside the Navy, 15 July '91)* has the submarine's contribution to such a system, albeit tactical, been recognized again in the open literature.

(3) Regarding the Standard missile's performance for the ASAT mission, several concepts were analyzed by Rockwell as to platform, missile, and launcher options, and their utility and cost of modifications. The object was to use existing assets as much as possible to reduce cost and development time. The Block IV SM-2, with a kick stage, was found to allow the intercept ranges predicted in the short term. The modified missile length was 14 to 19 feet, allowing use of existing launch tubes.

It is important to remember the complementary, yet parallel roles, played by kinetic- and directed-energy weapons. The two systems have different capabilities and require different countermeasures. Like the Triad, it is a sensible approach. The KKV (Kinetic Kill Vehicle) is envisioned as being operational within a 10-year time frame. While this may seem long, it is optimistic nowadays. The KKV system's inherent performance limitations have always been recognized. Effectiveness must be examined in the context of cost versus increased range, accuracy, lethality, and time to IOC. The weapon is viewed as an interim solution until directed-energy weapons become viable and cost-effective. Systems such as the chemical oxygen-iodine high-energy laser and beam control system developed by the Air Force, will provide the needed range, and are likely to be operational by the year 2000.

The Army KKV weight is likely to be less than the 20 kg that Mr. Thompson quoted. (With the exception of deployment of the early F-15 ASAT miniature homing vehicle weapon, the Air Force is not involved in the KKV program.) High terminal velocity and/or long range is possible in smaller vehicles, in part, because of the development of gelled propellants providing the performance of liquids and stability of solids. The latter result

in a much higher degree of safety, which is a concern in storing propellants aboard aircraft and ships. As a result of continued research by companies such as Aerojet and Rocketdyne, a high performance KKV the size of a coffee can is conceivable by the IOC date of the KEW (Kinetic Energy Weapons) system. The garbage disposal-sized systems that have been shown in the press are concept-of-validation units, and not intended to portray operational systems in size and weight.

By the way, the KEW terminal guidance system is likely to use *both* visible and passive IR, rather than one of the two. The reason for this is to help defeat countermeasures. This, and proposed hanger tests, are the primary reasons Rockwell won the sole source contract.

(4) Using the Trident and Poseidon SLBM for ASAT deployment is not realistic. This option was studied closely as part of the original HYVINT program, and later as part of SDI's Maritime Adjunct Committee Study. Missile verification is a nightmare. It is not likely an adversary would accept a strategic arms treaty allowing construction and basing of additional SSBNs which are indistinguishable from their nuclear warhead counterparts. Launch during a contained conflict could result in escalation if decisions were based solely on signature data (image or metric) measured by a space-based surveillance platform. Even the use of a Tomahawk- or Standard-missile envelope is subject to future arms negotiations and reduction, since weapons of this size may play a quasi-strategic role, i.e., similar in range and lethality to early SLBMs.

I hope this clears up any misconceptions that may have resulted from my article. As is often the case, papers must be shortened in the interest of space and cost. This paper was no exception, requiring editing from the original 100+ page report to about eight. Certain areas, such as oceanographic ASW and missile interfaces, were either shortened or deleted.

*David Nahrstedt, Ph.D., Optical Engineer*
*Air Force Maui Optical Station*

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## THE ROUNDTABLE DISCUSSION
(SUBMARINE REVIEW, October 1991)

It is certainly useful to get such high level submarine people together to define the future of nuclear attack submarines

(SSNs) in the expected environment of Third Power contingencies. Unfortunately, the Kuwait War was not one in which SSNs could play a significant role. In fact, the actual use of U.S. nuclear attack submarines in the "Gulf War" seemingly demonstrated an inapplicability of SSNs in the probable low intensity conflicts of the next several decades.

A look at what happened in the Iraq War shows that: the land-locked nature of Iraq, the shallowness of the Persian Gulf, and the dangers of the transient Iraqi mines and fixed minefields forced U.S. submarines to operate at great distances from their cruise missile (Tomahawk) targets; the consequent firing ranges for SSNs made it less costly and more reliable to deliver Tomahawks by surface ships which were much closer to the same targets; there were no torpedo targets; the presence of SSNs in the general area of the Iraq aggression had no apparent deterrent effect on Saddam -- if he even considered them as an element of threat to his plans; furthermore, the SSN's quality of stealth had little or no significance in submarine operations; and the submarine surveillance mission had only a few enemy ship movements which might be observed.

The Iraq War was the wrong war for deriving profound judgements as to the future of U.S. SSNs. But the major utility of SSNs for most Third Power contingencies can be established -- if the SSN's operational advantages and limitations are properly recognized. The Discussion group, it should be noted, produced a sound picture of the SSNs important role in future low intensity conflicts, but it was perhaps overly optimistic.

Why overly optimistic?

For one, *stealth* was considered to be an absolute, unvarying premium quality of the U.S. SSN. However, stealth of an SSN is more than its quietness. There are other signatures which are detectable by airborne means which an SSN might generate in various modes of operations, and particularly when operating close to the surface. In that aspect, an SSN has a number of different types of signatures (IR, inner wave effect, visible wake, magnetic anomaly, nuclear traces, vortex disturbances) which might be detectable by airborne means. Thus, an SSN operating in shallow waters and necessarily close to the surface is likely to have its quality of stealth significantly degraded.

A second qualification should be applied to the SSN's cruise missile which is somewhat less than an *ideal* weapon. This is

true of the Tomahawk missile as it is configured now; and this was recognized by the Discussion group. But for Tomahawk to evolve into a very good weapon for SSNs belies the past history of attack submarine weapons (missiles as well as torpedoes), and the Tomahawk requirement for near-time target data. At the same time, the submarine community's avowed focus on missiles as their bread and butter, remains suspect.

SSN operations in the Iraq War suggests that their future lies in their employment of long range, appropriate-warhead cruise missiles with torpedoes finding little use, and that the SSN needs a means to project its submarine power into shallow waters other than with the SSN itself -- allowing the SSN to operate in waters where it can minimize all of its signatures including noise so that it continues to maintain a high degree of stealth.

*W. J. Ruhe*

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## A REMEMBRANCE

Enclosed is a check in the amount of $175.00 to cover the cost of a life membership in the Naval Submarine League for my father, Keeven Martin Hurtt, Gunner's Mate Chief, United States Navy, Retired. This life membership is to be a Christmas gift to him.

It seems fitting to honor my father in this manner during the 50th anniversary year of the bombing of Pearl Harbor. My dad spent virtually all of the World War II years serving aboard submarines in the Pacific. At the time of his retirement from the Navy, he was serving as the first Chief-of-the-Boat aboard the USS SEAWOLF. I am grateful for the sacrifices which my dad made so that I can live comfortably and safely today. It is because of men like him that this country is so great.

Thank you for taking care of this matter for me. I am proud to be associated in some manner with the *silent service*, one of the most unique outfits (fighting or otherwise) ever assembled on the face of the earth.

*Sharron I. (Hurtt) Hanzel Gooding*

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## IN THE NEWS

Although the SEAWOLF continued to claim the bulk of submarine news over the past several months, history probably will note that the more momentous news certainly was President Bush's statement significantly, and unilaterally limiting U.S. nuclear weapons deployments -- including those on attack submarines.

The SEAWOLF coverage included reports of the ebb and flow of Congressional tendencies to authorize the FY-92 ship of the class, status updates on the hull cracking in the lead ship, new developments in the contract dispute over the award of the second ship, and a fair amount of commentary concerned with whether the nation should continue with that building program at all.

Discussions of the new Strategic Command, new missions for attack submarines, new kinds of attack submarines, and even the possibility of women serving in submarines have all attracted some attention in the press. The general news noted, among other items of interest, that the Submarine Force is leaving Holy Loch and that the Chinese Navy (PRC) lost a submarine at sea.

**Nuclear Weapons**

- The Washington Post of September 28th carried the President's statement in full and the specifically applicable portions are quoted: "I am therefore directing that the United States eliminate its entire worldwide inventory of ground-launched short range, that is, theater nuclear weapons." ..."Recognizing further the major changes in the international military landscape, the United States will withdraw all tactical nuclear weapons from its surface ships and attack submarines, as well as those nuclear weapons associated with our land-based naval aircraft. This means removing all nuclear Tomahawk cruise missiles from U.S. ships and submarines, as well as nuclear bombs from aboard aircraft carriers. The bottom line is that under normal circumstances, our ships will not carry tactical nuclear weapons. Many of these land- and sea-based warheads will be dismantled and destroyed. Those remaining will be secured in central areas where they would be available if necessary in future crisis."
- Defense News of October 7th reported that "The Soviet

Union wants submarine-launched nuclear missiles included in U.S.-Soviet talks on reducing the number of weapons deployed on multiple-warhead missiles scheduled to begin this week, Soviet officials said.

"Responding last week to the proposal of U.S. President George Bush for talks aimed at cutting to one the number of multiple independently targetable re-entry vehicles permitted on long-range nuclear missiles, Soviet officials (in Moscow) stressed the inequity of the U.S. proposal that would require Moscow to make much deeper cuts in its missile force.

"About 85 percent of Soviet multiple-warhead missiles are deployed on land, according to Soviet estimates, while the majority of U.S. multiple-warhead missiles are based on submarines that are considered virtually impossible to track."

**The SEAWOLF Budget Process:**

• Forbes magazine in its September 30th edition which came out in mid-month, summed up the problems in an article titled "SEAWOLF at bay," with a lead paragraph that expressed a prime shipbuilder concern. "Worries are growing at the two yards capable of building the sub ... (that) if not canceled, this program vital to their futures will be stretched out." The article went on to describe the original program of three per year, commenting that the new subs "...would replace LOS ANGELES class subs, which cost less than half as much each." This was followed by a 37 word questioning of the need for SEAWOLF now that "...the U.S.S.R. is going out of business." The contract dispute and hull cracking problem were both discussed in short paragraphs and the advent and implications of the Centurion study were similarly covered.

In addition, the combat system was also mentioned as a problem: "A large part of the package is a complex battle management system called BSY-2 or "Busy Two". General Contractor on the BSY-2 is General Electric. The computer system's total cost isn't known ("in the billions", says Ronald O'Rourke, a naval analyst with the Congressional Research Service), and its technology is still miles from being completed. Likewise, development of the new torpedoes, mines and missiles that are to be carried by SEAWOLF is still a long way from being completed, and no cost estimates are available. Critics say BSY-2 and the weapons could lift total cost of a single SEAWOLF to $3 billion or more."

• The Washington Post of September 21st reported that "The Senate Appropriations Committee yesterday approved a 1992 defense spending bill that raises further doubt about the future of the B-2 bomber while giving new life to the SEAWOLF attack submarine." The news commentary went on to describe the recent history of the submarine portion of the defense bill.

"The SSN-21 SEAWOLF attack submarine program, which had appeared in jeopardy Thursday, got a reprieve when the committee restored $2.38 billion that the administration had requested to buy one SEAWOLF. Senator Daniel K. Inouye (D. Hawaii), chairman of the Appropriations defense subcommittee, had argued on Thursday when the panel eliminated money for the submarine that the money would be better spent on building two older-model LOS ANGELES-class attack submarines. He said the SEAWOLF was encountering too many problems.

"But Inouye changed course yesterday after what he described as intensive lobbying by Navy Secretary H. Lawrence Garrett III, officials of the SEAWOLF contractor Electric Boat Division of General Dynamics Corporation, and the senators from Connecticut where Electric Boat is headquartered."

• Defense Week of October 7th carried a somewhat in-depth report of the Senate subcommittee actions and the lobbying behind it. In part, the piece said that: "Behind Inouye's reversal was a case study in effective lobbying and tag-team play between the Iron Triangle of industry, the Pentagon and Capitol Hill. Senators phoning senators into the night or twisting arms on the Senate floor. Lawmakers mobilizing industry lobbyists and the Navy, polling them for hard facts to use as ammunition with other lawmakers." The article continued with some background: "Neither Navy legislative affairs officials, senators with SEAWOLF constituent interests, nor industry lobbyists paid to get an inside track knew that Inouye or his staff wanted to delay the SEAWOLF. There were none of the traditional rumblings that accompany such a recommendation. Besides, Inouye had previously supported the sub." After speculation as to why the delay came to be favored, the article discussed the down side of that argument: "The SEAWOLF proponents feared that if the submarine was delayed, termination would soon follow. And if it was killed in favor of LOS ANGELES subs, the Pentagon wouldn't save

money as Inouye believed. 'Our point was to show them it'll cost this much to terminate the SEAWOLF, this much for LOS ANGELES start-up, and when you get to the end, this is how much you really save.' said the Navy official."

- Defense News of September 23rd also commented on Inouye's subcommittee reversal but cited further doubts: "Ted Stevens, R-Alaska, ranking minority member of the subcommittee, agreed to go along with the change, but warned that it bodes ill for the Navy's future submarine program. By pursuing the expensive SEAWOLF program and the complementary new Centurion submarine, 'both programs are going to lose,' he warned last Friday. 'I believe we are kissing the submarine program goodby.'"
- Defense Daily of October 4th reported on the opinions of another Senator with: "Senator John McCain (R-Arizona) said yesterday the SSN-21 SEAWOLF submarine, the B-2 Stealth bomber and mobile Peacekeeper missile will not survive more than another year." It went on: "McCain has long said the almost $2 billion SEAWOLF is wasteful, and put forth two efforts in the past two months to end production of the submarine."
- Inside the Navy of November 25th ran an article examining the SEAWOLF program and concluded that "its future is cloudy." The first paragraph sums up the paper's account: "The Navy's next-generation nuclear attack submarine, the SEAWOLF, survived a barrage of attacks during the fiscal year 1992 budget process but its future looks bleak. Although the SEAWOLF slipped through in this budget, the FY-93 process could be an even tougher battle for the Navy. Because of skyrocketing cost estimates for the first SEAWOLF being built by Electric Boat in Groton, CT, the diminishing Soviet threat and the lawsuit holding up the contract award of the second SEAWOLF, a wide range of congressional and industry sources believe the SEAWOLF program will be short-lived with its final numbers being in the range of three to six. Yet ardent supporters of the SEAWOLF do not plan to give up the fight. While continuing to buck the trend that the Soviet threat is dead, the supporters are justifying the submarine's expense by playing it up as having multi-role capability, similar to the arguments being used by advocates of the Air Force's B-2 long range bomber."

**SEAWOLF Hull Cracks:**

• Hartford Courant of November 17th noted the release of a summary of the Navy's Inspector General's report: "Navy investigators, who were asked to look into what caused the microscopic cracks in the hull of the first SEAWOLF attack submarine, Thursday released details of a new report that appears to avoid assigning primary blame to either the Navy or Groton's Electric Boat. Their report summary hinted the Navy shouldered much of the responsibility, however, for failing to follow up on unspecified problems encountered in a mid-1980s production test that were 'recognized as an early warning' of deficiencies in the vessel's new HY-100 steel welds." The Courant piece went on to note that "Both the Groton shipyard and its supporters on Capitol Hill had been hoping however, that the Navy, as designer of the SEAWOLF welding specifications, would accept full responsibility for the cracks."

• Inside the Navy of November 25th published the letter from Gerald Cann, Assistant Secretary of the Navy for Research, Development and Acquisition, to Rep. Sam Gejdenson (D-CT) which forwarded a copy of the report along with Cann's comment that "We are confident that the hard look we have taken because of the HY-100 weld deficiencies will benefit the Navy not just in shipbuilding but in other acquisition areas." The paper then went on to comment that: "The Navy is estimating that the cost of the repairs will range from $50-million to $100-million.

**SEAWOLF Contract Dispute:**

• Richmond Times Dispatch of September 21 reported on the latest round of court filing and asserted in its headline that "Bidding Rules Set After Offers For SEAWOLF."

"The Navy sought and received bids to build the nation's second SEAWOLF submarine several months before devising an acquisition strategy to underpin the purchase, according to court papers filed this week in the multi-million dollar case.

"...the legal papers show that ground rules for the high-stakes bidding game were not set when the game began.

"The Navy asked ... for bids on the pivotal contract in November 1990. The shipyards put their offer on the table in early January. More than four months later, Defense Department officials finished haggling over how to weigh basic factors in evaluating the bids, the papers show. Two weeks after that,

the Navy awarded a $615 million contract to Electric Boat. Newport News Shipbuilding filed suit.

"In the court papers, the Navy argues for overturning a July 31 decision by U.S. District Judge Robert G. Doumar that voided the contract and ordered new bids. According to the Navy, the 4th Circuit Court of Appeals should reverse Doumar because the judge mistakenly substituted his judgement for that of trained military minds."

Later in the article it continued with: "While Newport News Shipbuilding bid about $88 million higher than Electric Boat, the Virginia shipyard said the Navy had virtually guaranteed it the contract if its bid was under $708 million. Long after the bids were submitted, Pentagon officials still were debating whether to hold a straight-up competition, or perhaps pick the high bidder to introduce competition to the program. Competition could save money in the long run and preserve an industrial capability to mobilize in an emergency.

"Because Electric Boat was building the first SEAWOLF, it had suppliers and a labor force in place that translated into a cost advantage for future bidding. Newport News Shipbuilding needed a break to get equal footing. In the legal papers, the Navy noted that in December 1990 -- after seeking bids for the second SEAWOLF, but before receiving them -- the Pentagon reduced the SEAWOLF program."

The article closed with: "Still, the court papers show that the Navy had a plan to keep both yards in the program through fiscal 1993 by awarding the second ship to Newport News and the third to Electric Boat."

• Inside the Pentagon of November 7th reported that it had obtained "An internal Pentagon study completed last January" which recommended that Electric Boat be awarded the second SEAWOLF because Newport News was "already operating at its peak-efficiency capacity." The paper described the report as: "A thorough analysis of the nation's two nuclear capable submarine shipyards, the study overturned conventional wisdom by arguing that, on the basis of industrial base considerations, the FY-91 SEAWOLF should be awarded to lead-shipyard Electric Boat, which also offered the lowest price for building the submarine.

"News of the report first surfaced in March, when Congress was considering whether to mandate that the FY-91 SEAWOLF be built at Newport News Shipbuilding. Prepared by the Office

of the Secretary of Defense (OSD) productions and logistics staff, the report instantly sparked debate among supporters of both submarine shipyards. Although the study was ostensibly prepared in response to a Senate directive in its version of the FY-91 defense authorization bill, the report was never delivered to Capitol Hill.

"Nevertheless, the study was presented to Under Secretary of Defence for Acquisition Donald Yockey, who reportedly used it as the basis for his oversight decisions in the program. When the Navy suggested in April that the FY-91 boat be awarded to Newport News, Yockey rejected the plan, and directed the Navy to award the ship based on the 'best overall cost for the government,' a clear reference to the study's conclusion that the cost of other ship programs at Newport News would increase if the shipyard was awarded the FY-91 boat."

The paper then published the January 1991 report in its five page entirety.

• Associated Press reported on its wire service on December 4th that "Newport News Shipbuilding lawyer Gregory Stillman told a federal appeals court yesterday in Richmond the U.S. should defer a decision on employing just one American shipyard to build SEAWOLF attack submarines. The decision should be delayed 'until the world situation clarifies,' Stillman said in arguing his company's case to obtain a second SEAWOLF contract."

• Hartford Courant of October 23rd ran a humorous Op-Ed piece by a copy editor of The Virginian-Pilot in Norfolk in which it was suggested that "...both sides can still win if they don't build any SEAWOLFs and just split the cash. This approach has several advantages" the piece postulates, among which are:

> "Perhaps each community that was counting on a piece of the SEAWOLF action could just throw a big party and invite the other side to make up."
>
> ".. maybe the workers could all take a couple of years off and go to college ... suddenly America would have the smartest shipbuilders in the world."
>
> "Consider how many layers of bureaucracy would be eliminated ... if the Pentagon could eliminate all the accountants, systems analysts and other pencil-pushers it

now needs to verify that monster weapons actually work..."

**The SEAWOLF Discussion:**

• Navy Times of October 7th quoted the CNO as to the future of the Navy's submarine building programs:

"The SEAWOLF program, originally planned as a 30-boat class, could end after construction of only seven submarines, according to Chief of Naval Operations Admiral Frank B. Kelso II.

"'SEAWOLF is not a forever submarine,' Kelso said at a defense writer's breakfast September 25, describing how the Navy will end SEAWOLF and 'move ahead' to build 'a next-generation low-cost' submarine by 1997 or 1998. This is three years earlier than Navy officials told Congress last May.

"Because it takes 12 years to design and build a submarine, 'we can only push (a new submarine) so fast,' Kelso said. The earliest plans for the next generation submarine, Centurion, were drawn in November and December 1990.

"'We never intended to build one submarine at a time,' Kelso said, adding it was vital to keep the present submarine-building capability."

• Boston Globe of November 23rd commented with a piece titled "A SEAWOLF Past its Time."

"In last summer's military budget debate, Congress gave the SEAWOLF nuclear attack submarine a free ride. The SEAWOLF passed the Senate 90-10 and sailed through the House as well. As a result, Americans are committed to pay $2.5 billion in 1992 -- and are scheduled to pay $18 billion by 1997 -- which will buy seven attack submarines the Navy simply doesn't need. Like other weapons planned at the height of the Cold War, the SEAWOLF has become expendable not only because it carries a big ticket, but also because the mission for which it was designed is no longer compelling."

After noting that "SEAWOLF was designed to fight underwater duels with the likes of 'Red October'" and decrying the 'Maritime Strategy' for targeting Soviet SSBNs, the paper noted that "... the U.S. will be able to get by with 80, 60, or even 40 attack submarines. At the moment, it has 91. So much for the bean count. At $2.5 billion a copy, there is no need for another SEAWOLF."

• Government Executive, in its November issue, also quoted

Admiral Frank Kelso as saying that a "Leaner Navy Should be 'Just as Fine'." In its coverage the magazine noted that "Kelso concedes that the service may be lucky to buy half a dozen of the new SSN-21 class SEAWOLF submarines now in production, where it had once envisioned a fleet of 30 or more.

"I want to be straightforward and acknowledge that the SEAWOLF program is coming to fruition at a time when the threat it was built for doesn't look as menacing as it once did, and I don't want to overemphasize the need for the SEAWOLF to counter a big Third World threat,' says Kelso, who nevertheless lauds the capability represented by the $2 billion submarine. He expects to buy the SEAWOLF at the present rate of one a year until 1997 or '98, at which time the Navy hopes to introduce plans for a less expensive submarine."

• National Defense, the monthly magazine published by the American Defense Preparedness Association, in its November issue carried an article titled "Submarines for the Post-Cold War Navy" in which it covered the SEAWOLF-Centurion debate and offered the following suggestion: "Continued production of Improved 688's, modified as new technology becomes available, would preserve the industrial base, ensure a minimum force level, and fulfill Centurion's missions at half the cost of SEAWOLF.

**The General Submarine Discussion:**

• Defense News of September 23rd carried a letter from T. L. Phillips of Chula Vista, California, which responded to another letter published in the July 29th issue under the headline "Sub Hysteria." Mr. Phillips countered the various points offered in the earlier letter and gave substantive reasons for being concerned about the threat from the submarines of the Third World navies.

• Navy Times of October 7th carried a major article titled "Modular Submarines Among Options for 2010" which quoted a CDR Steve Pelstring of the Navy's Strategic and Theater Warfare Division as saying that "While the Navy is building two types of attack submarines ... and one strategic missile submarine ... the service would only build one class of submarine under the future modular concept..." "Central to the modular concept is that significant cost savings can be achieved by building identical front and rear sections of a submarine with only a specialized middle section, housing either ballistic missiles

or torpedoes. That will determine whether the submarine will be outfitted for attack or strategic deterrence missions."

- Inside the Pentagon of October 24th reported that "The Office of the Secretary of Defense (OSD) is quietly studying whether conventionally powered submarines can perform some of the missions the Navy assigns solely to nuclear-powered submarines." It went on to identify the two OSD offices making the studies as "...Program Analysis & Evaluation (PAGE) and the naval warfare and mobility shop under the director of defense engineering."
- Navy Times of December 2 reported a speech by Vice Admiral Roger Bacon, Assistant CNO for Undersea Warfare, in which he said that the Navy would begin studying the issue of women crew members aboard submarines while it designs the Centurion class submarine.

**General Submarine News:**

- Evans & Novack Political Report of 10 September, in looking toward action on the Defense Budget predicted a major "anti-Defense fallout," citing several primary effects -- one of which was: manpower and training are known to be easy victims of premature overcutting. Instead, the Chiefs want the strategic services hit first, saving the Navy's missile-subs for least reduction. The Triad could be changed around."
- The New York Times of November 10th reported from Dunoon, Scotland, that the last missile submarine, USS WILL ROGERS, had left the American base in Holy Loch. The report also mentioned that the submarine was followed by anti-nuclear demonstrators in a small launch as it left port on a last patrol before returning to its home port in New London, CT.
- Los Angeles Times on November 17th cited Jane's Defense Weekly for reporting photography of "...a sonar-evading 'stealth' submarine that defense experts regard as the Soviet Navy's most modern secret weapon." They quoted Jane's as saying that "... the submarine, the BELUGA, was photographed in the Black Sea port of Sevastopol on November 3rd. It is believed to be the only one of its kind in service with the Soviet Navy."
- Washington Times of December 2nd reported that "Communist China has lost a conventional Romeo-class submarine in the Yellow Sea, and ships and helicopters from the People's Liberation Party have not been able to find it."
- Reuter, on its wire service of December 4th, reported that:

"Chief of the Soviet General Staff, General Vladimir Lobov, toured Britain's top-secret Polaris submarine base yesterday at Faslane Bay, Scotland. Lobov smiled and gave a thumbs-up sign as he descended into the nuclear-powered Polaris submarine HMS REVENGE for an inspection. 'We have left behind the enemy image,' the Soviet General told reporters. 'We believe the world should develop in a different direction. We should not search for enemies, we should cooperate. We need contacts.'" ■

## 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. ■

## SUBMARINES OF THE RUSSIAN AND SOVIET NAVIES, 1718-1990

by Norman Polmar and Jurrien Noot
Annapolis, MD: Naval Institute Press, 1991
pp 370, Price: $58.95

*Reviewed by Rear Admiral Sumner Shapiro, USN(Ret.)*

I admit that I approached the review of this weighty tome with some misgiving. My first reaction was, "Submarines in 1718 -- they've got to be kidding!" Once I had accepted the premise that submarine development might have started way back then, and by the Russians to boot, I began to question whether the authors could actually condense two and a half centuries of technical development and operational experience into 370 pages, and come up with a useful product. I have to say that they surprised me. They successfully and artfully crammed an impressive amount of useful historical data between the covers, providing a reference of considerable value to students of the Soviet Navy. If I have a reservation about the book, it is not with the historical treatment, but with its technical assessments of postwar Soviet submarine developments, and with the projections of where Soviet design can be expected to go in the future. I find myself in basic disagreement with some of these assessments; others have been invalidated by recent developments in the rapidly changing Soviet environment. Since Norman Polmar acknowledges that he alone is responsible for the chapters addressing post-World War II submarine programs, I guess my argument is with him. Norman would probably claim that I have a built-in bias -- against him and anything he writes -- but that is only partly true. When Norman sticks to the facts, I have no argument with him. When he ventures into the realm of speculation, as I feel he does in those chapters, we tend to have our differences -- intellectual and professional.

But back to Submarines of the Russian and Soviet Navies, 1718-1990, and its positive aspects. A tremendous amount of diligent research obviously went into the historical narrative, tables, photographs and illustrations of this reference work. I

am reasonably familiar with Russian and Soviet naval history, but I have never seen anything to match the chapters on early Russian submarine developments, and their operations up through the first World War. I found this fascinating to read and highly enlightening. I was also quite taken with the book's coverage of the Allied Intervention following the Bolshevik Revolution, the Soviet shipbuilding programs between the wars, and the operations of Soviet submarines during World War II. All very solid material, and well presented. Although not specifically referenced, I assume that much of this historical material was derived from the several prestigious reference works listed in the book's extensive bibliography. I would like to have known where it came from.

I view this omission as a shortcoming, but it does not detract from the quality of the work involved, nor the value resulting from the ambitious task of compiling all that information into the useful, readily accessible and highly readable form presented by the authors. In short, the material may be available in various other sources, but not at the unclassified level, and not in the detail and as well packaged as in this reference. It is a remarkable compendium of data on Russian and Soviet submarine developments and operations through World War II. I doubt seriously that anything like it exists elsewhere. In that respect, it is a unique and exceptionally valuable reference.

The same, unfortunately, cannot be said about the chapters covering the period since World War II, and particularly the past 20 to 30 years. Perhaps because that period is still fresh in my mind, much of what I read in that part of the book seems old hat to me, and not as exciting as the earlier narratives. Since I am personally much more familiar with that period of Soviet Navy history, the warts were also much more apparent to me. Quite possibly, it is simply too early to attempt a history of that period. Every day we learn something that alters our previous understanding of developments and events, and invalidates the conclusions which we reached. As a result of Soviet openness -- *glasnost* -- and a variety of factors like the sinking of the MIKE in the Norwegian Sea, access to Soviet scientists, technicians and operators, an abundance of open source material, etc., we are able to establish *ground truth* and thus revise or fine-tune earlier perceptions and estimates. I saw little if any evidence of this having been attempted in this book.

Rather, you get the impression that a picture has been frozen in time, and little effort appears to have been made to update or correct observations overtaken by subsequent events. Especially flawed are conclusions set forth by the author(s) with regard to technical developments and capabilities of current Soviet submarines, and projections of future trends.

Take, for example, the ALFA SSN. A case is made in the book for the small, fast, deep-diving ALFA to serve as the prototype for future Soviet submarine development. The ALFA has since been written off by the Soviets, and subsequent submarine designs now in series production begin to look more like their U.S. counterparts -- large, multi-mission ships with the emphasis on stealth, rather than excessive speed and depth capabilities. And then there is the book, The Navy: Its Role, Prospects for Development and Employment, written by three Soviet naval officers with a foreword by Admiral Gorshkov, and published with some fanfare in 1988. A lot of stock has been put in that book as a roadmap for where the Soviets are headed in undersea warfare development. The trouble is that this book, like Lenin's writings, has something in it for everyone. Just pick what appeals to you and run with it -- as many U.S. analysts did. Now, like Lenin and his writings, the book has lost its credibility. It is OBE -- overtaken by events. All bets are off, and it is back to the drawing board -- both for Soviet planners and developers, and for those of us who try to fathom where they are headed next. Talk about a Soviet *supersub* -- which that book helped engender -- is just that. If the *supersub* was ever anything more than the figment of some analysts' imagination, the chances of its realization now are indeed very remote. Likewise, while I agree that the Soviets have strived in recent years for qualitative improvements in their submarine force -- and made significant progress in that regard -- I fail to see any real evidence of their reaching the point by the year 2000, as cited in Submarines of the Russian and Soviet Navies, where their submarines will be equal or superior to the U.S. Navy in all technologies except passive sonar and in the quality of personnel.

Presenting such speculation as fact does a disservice to the reader, not to mention the job that it does on the credibility of an otherwise excellent reference book. Let's face it, though, there have been many very significant changes throughout the

Soviet Union and within its defense and military industrial establishments. A lot of analysts -- within the U.S. Government and elsewhere -- are busily revising their estimates to accommodate these changes and take advantage of the growing openness of Soviet society. It must be recognized, though, that *glasnost* notwithstanding, there is still much about the Soviet Submarine Force of today that we do not know. There is even greater uncertainty about the future. Under the circumstances, I submit that there might be some advantage to backing off and waiting another five years or so before trying to reconstruct the picture of the current turbulent period in Soviet Navy history. Perhaps by then, sufficient information will have come available and we will be in a position to make more reasoned judgements of where the Soviet Submarine Force is and where it is going.

Much is to be gained, I suggest, in looking back and learning from the past. There is good illustration of that in those portions of this book which confine themselves to historical fact. As you read those chapters, it is abundantly clear that there was nothing wrong with the submarines and the submariners of the Russian and Soviet navies in the two world wars. They just were not employed very well. However, when given the opportunity to demonstrate their technical and operational prowess in what were essentially defensive land-locked wars, they proved to be quite innovative, resourceful and capable. The question before us is how will that technical and operational capability -- machines and men -- be employed in the future? How will it be used, either by the Soviet Union or the Republic(s) that happen to own them then -- or, for that matter, wherever else in the world and under whatever flag they might appear? History tends to repeat itself. The answers -- or at least some helpful hints -- may be found within the pages of a book like Submarine of the Russian and Soviet Navies. ■

National Broadcast

*[Executive Director's Note: SUBMARINE: Steel Boats, Iron Men (SBIM), a video sponsored by the Naval Submarine League and underwritten by a number of NSL Corporate Benefactors, was broadcast by Public Broadcast stations across the country on Wednesday, November 20, 1991. We believe that our goal of reaching a broad public audience with a documentary depicting the heritage, training and mettle of submariners was accomplished in spades. Pertinent extracts of material generated incident to the occasion are presented below.]*

*Dateline New York Times, Wednesday, November 20, 1991.*
*By Walter Goodman*

"The striking thing about **Submarine: Steel Boats, Iron Men** is the list of underwriters. Ready? The hourlong documentary ... was paid for by Newport News Shipbuilding, Hughes Aircraft, GE Aerospace, General Dynamics, Lockheed, Rockwell International, IBM, Westinghouse and 11 other companies known better to the Pentagon than to the public.

"Viewers like you?

"This consortium should be reasonably satisfied with what they have launched. The documentary, which was filmed in part aboard the HYMAN G. RICKOVER, a nuclear-powered fast-attack submarine named for the admiral credited with developing America's nuclear navy, is a celebration of submarines and a tribute to their crews.

"That is not to suggest that the military contractors had a hand in planning the program or that the producers, David Hoffman and Kirk Wolfinger, did anything unbecoming in taking their money. How else, given the propensities of public broadcasting, could they have fueled their vessel?

"If they had set out to torpedo America's nuclear arsenal, they might have got some assistance from **Frontline**. If they were exposing the conflict between submarines and ocean life, the Costeau or National Geographic folks might have been interested. If they had promised a report on multi-culturism in undersea schools, PBS would certainly have sprung to their aid. But a flattering program about nuclear submarines? Where

could they find support but at companies that have a stake in arms and the men who use them.

..."The producers report that their cameras are the first in more than 20 years to be permitted aboard a Navy submarine. As the armed forces compete for shares of a diminishing military budget, taxpayers can look forward to programs from inside a bomber, a tank, a humvee. Producers in search of subsidy can start with the list of tonight's underwriters.

"Hey PBS, time for an expose' of the military-industrial-television complex?"

*Letter from PBS to Walter Goodmen, November 22, 1991.*

..."Come on Walter. You know you can't fire salvos at public television like those launched in your review of **Submarine: Steel Boats, Iron Men** (11/20/91) without getting some kind of response from us. So here I am, wearily loading the torpedo tubes to fire back, knowing that this has all been done before.

..."For the record, the editorial focus of **Submarine** was always meant to be **a day in the life** of the people who work on a nuclear submarine, not an examination of submarine technology nor of U.S. defense policies. PBS looked very carefully at the content of the program vis-a-vis the funders, and found that no special interests are represented in the film, nor was there any form of editorial involvement, rights of review, or content control in any form on the part of the funders. We're satisfied the producers had full editorial control.

"If the point you were trying to make in imagining different **submarine** programs and their funding scenarios was that public television needs stable permanent funding we're in agreement. But suggesting that public television is somehow captive of the **military industrial complex** is nonsense....

*Mary Jane McKinven*
*Director, National Press Relations"*

*Letter to NSL from Varied Directions, Inc., November 27, 1991.*

"Gentlemen:

..."The airing of Steel Boats, Iron Men was one of the proudest and most rewarding of my career; I know I speak for everyone at Varied Directions in thanking NSL for letting us

make this remarkable story into a film.

..."Usually, when our films are broadcast, we hear reports from our colleagues in the business and the people immediately attached to the production; this broadcast was very different. The 800 number inviting people to purchase the tape ignited a flood of calls from across the country that lasted until 2:00 a.m. and all through the day on Thursday. While not everyone buys the tape, their feelings about the production are unanimously euphoric.

"As I suspected, Walter Goodman's blast at PBS in the N.Y. Times raised the specter of controversy and no doubt contributed to the excellent ratings the show received. **SBIM** won the evening and also out performed the Wednesday 9:00 p.m. time slot for the year by more than a full percentage point, in rating terms, a most impressive showing....I'm impressed with [PBS's] bold response; quite unusual for them. It also should make our underwriters pleased that PBS is willing to go to bat for their right to fund a project of this nature. PBS is beginning to understand that it can't be the domain of any single political ideology.

..."Once again, our sincere appreciation for allowing us to be a part of this project.

*Kirk Wolfinger*
*Producer and Director, Varied Directions, Inc.*"

[The actual number of viewers was not available for this issue of the Submarine Review. The "11 other companies (really 13)" alluded to by Mr. Goodman were:

**Vitro, Babcock & Wilcox, Kollmorgen, Bird-Johnson, Treadwell, Computer Science Corporation, Zachary Fisher, Advanced Technology, Honeywell, Purvis, Trident Systems, EDO Corporation and Scientific Atlanta.**

NSL again expresses its sincere gratitude to the Underwriters, Varied Directions, Inc. and the Navy for helping to bring this major project to fruition.]

■

**The price of this video has been reduced to $29.95, plus $5.00 for shipping and handling.**
**To order your copy call: 1-800-888-5236 -- or write to Varied Directions, 69 Elm St. Dept. SR, Camden, ME 04843.**

## REUNIONS

**USS SEA LEOPARD (SS-483)** - July 1992 - Norfolk, VA

**USS SIRAGO (SS-485)** - July 1992 - Norfolk, VA

**USS RATON (SSR-270)** - July 1992 - Norfolk, VA

All officers and crew members of the above boats please contact:

Wendell Rausch
RRI Box 78
Akeley, MN 56433-9725
(218) 652-2441

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## SUBMARINE MEMORIAL DEDICATION
May 16, 1992

A submarine memorial dedication in honor of all submarine veterans who served in World War Two will take place on Saturday, May 16, 1992, at 3 p.m. in Logue Industrial Park, at the corner of WAHOO Drive and West Fourth in Williamsport, Lycoming County, PA. The memorial consists of a 21 foot long WWII torpedo, a ship's anchor and a propeller.

All active and retired military personnel, submarine veterans and guests are invited to the 3 p.m. service. If you plan to attend, please contact memorial committee secretary by 1 May.

Marjorie Ort
813 Lafayette Parkway
Williamsport, PA 17701
Phone (717) 323-4849

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The 30th International Submariner's Convention will be held in Willingen, Germany, April 21st to 24th, 1992. For further information and registration forms, please contact the Social Secretary:

Mr. Jack Wilkinson
21 Brabazon Road
Oadby, Leicester
LE2 5HP, ENGLAND

This Gala takes place during Easter Week, so an early booking is advisable.

■

**NROTC ESSAY CONTEST WINNERS - 1991**

First Prize Honorarium - $300.00
Midshipman Third Class Matthew Morris
George Washington University
**Stuck in the Seventies: Identifying the Enemy Submarine Threat Through The Next Decade**

Second Prize Honorarium - $200.00
Midshipman Second Class Craig S. Kujawa
University of California, Berkeley
**Innovation, Management and the Military: Perspectives on the Development of the Nuclear Powered Submarine**

Third Prize Honorarium - $100.00
Midshipman Third Class Scott J. Graybeal
University of San Diego/San Diego State University
**The Toshiba-Kongsberg Affair: The Birth of the Modern Soviet Submarine Force**

## NSL ACTIVE DUTY PRIZE ESSAY CONTEST

**Categories:**

- Senior Active Duty (05 & above)
- Junior Active Duty (04 & below)

**Prizes:**

- $300.00 for winner in each category.

**Judging:**

- Final determination in February 1992.
- Judging by NSL Editorial Review Committee.
- Award to best essays dealing with:
  ***Future Submarine Roles and Missions***

**Rules:**

- Essays must be *individual* efforts of about 2500 words or less; entrants by more than one author are not eligible for judging.
- Submissions to NSL must be clearly marked as entries for the NSL ACTIVE DUTY PRIZE ESSAY CONTEST.
- Essay entrants will not be published prior to judging except with prior concurrence of the author.
- Winning entries will normally be published in the **SUBMARINE REVIEW.**

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