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NAVAL SUBMARINE LEAGUE • Box 1146 • Annandale, VA 22003
(703) 256-0891 Fax (703) 642-5815 E-mail: subleague@aol.com
Web Page: www.navalsubleague.com

EDITOR'S COMMENTS

There are several special subjects treated in this issue which are not uniquely submarine in nature, but rather are of great importance to the broader interests of the U.S. Navy and the nation. The first feature is the statement of Admiral Bud Edney to the Judiciary Committee of the House of Representatives. Admiral Edney, currently at the Naval Academy in the Chair of Ethics and Leadership, had a very distinguished career on active duty and is now engaged in the vital work of imbuing the future leaders of the Navy with the traditions and values which underlie the life and success of the service.

The strategic concepts basic to the structure and the operations of the broader Navy are discussed in a second feature article which performs the long-needed service of articulating in one place the methodologies by which the Navy, integrated in all its diverse parts and working jointly with sister services and allies, can attain success in modern and future war. Necessarily wide in scope, these top-level considerations are those which will drive the way the Navy builds its forces and trains its people; therefore, are important for all in the submarine community to recognize, understand, and incorporate in planning and practice.

ASW is the third Navy-wide subject addressed as a feature. VADM Guy Reynolds shows the importance of the subject to the other navies of the world, lest we in the United States forget the vital part our integrated ASW capability played in the late, unlamented Cold War. The other featured broad-interest subject is offered as an observation by a recently retired submarine officer. The topic is the place of the retired component of the Navy, and indeed of all the services, in making sure the values by which we lived in the active-duty military are made known to general public.

There has been a good deal of discussion recently about the loss of SCORPION and it may be appropriate here to give renewed notice to two commentaries on the subject. The first is a letter which RADM Bob Fountain sent to the editors of the Naval Institute Proceedings criticizing an article published in that magazine's August '98 issue. Bob makes some excellent points of fact and offers opinions which many in the submarine community have applauded. In addition, the Hon. Robin Pirie, the Assistant Secretary of the Navy and one-time skipper of SKIPJACK, made

an address at the SCORPION Memorial in May which recalls much of what submarines were all about in those days.

On the more general submarine side of this edition, there are articles offering technical innovation (with a proposal for external carriage of weapons), great human interest (don't miss John Alden's piece about the Dutch submariners), history in war (the convoy controversy-after reading about the past try to decide how we'd handle the problem today), history in peace (building the innovative ALBACORE when many did not believe in the future of submarines), and other diverse subjects touching many facets of our interest.

Jim Hay

FROM THE PRESIDENT

As we complete the 1998 year there are many activities ongoing and being planned. The Submarine Centennial, of course, is occupying and will continue to hold the primary focus. Planning and fund raising is paramount now for the success of the program in 2000. Hank Chiles and his trusty sidekick, Dave Cooper, are doing yeoman work in the vineyards. All of this is in support of the Submarine Force and in cooperation with the Submarine Veterans of WWII and the Submarine Veterans Inc. And, as I have said previously, the plans for both the NSL/APL classified symposium [in May] and the NSL Annual Symposium [in June] are proceeding and both promise to be most interesting.

There is an unusual *focus study* in progress now and scheduled to wind-up in September 1999. It is one in which, given the topic about 15 years ago, submariners would not have generated much interest. Organized by the Lexington Institute it is called: "Naval Strike Forum". The NSF purpose is stated as:

> "...to educate policy makers and the public to the unique capability of Naval strike power.
>
> "Through research, seminars, media appearances and other activities, the NSF seeks to build a broader constituency and intellectual 'critical mass' for the effective sustainment and utilization of naval strike power."

Obviously, in this time of increasing overhead surveillance with the concomitant difficulty for operating forces [both land and sea] to remain undetected, the covertness, endurance and strike capabilities resident in our 688Is add new dimensions to the strike picture which heretofore were not so evident.

Finally, a book has recently been published entitled, Blind Man's Bluff. It purports to reveal the exploits of the Submarine Force during the Cold War. For obvious reasons the **SUBMARINE REVIEW** has chosen not to review it; but it is an unusual book. The various chapters, each one different, certainly paint a dramatic picture, whether true or not. The authors and others, including a couple of ex-Soviet, now Russian submarine retired flag officers, appeared on "60 Minutes" several weeks ago. At the end of the program, Ed Bradley asked the more vocal retired Russian admiral if the Cold War submarine operations such as those depicted in the book had any effect... To which the Russian said, "...none - nothing". My reply to his reply would be, "They lost".

Dan Cooper

STATEMENT SUBMITTED TO THE COMMITTEE ON JUDICIARY U.S. HOUSE OF REPRESENTATIVES

by ADM Leon A. Edney, USN(Ret.)
1 December 1998

Mr. Chairman, I appear before your distinguished committee today to participate in a panel discussion addressing leadership and ethics as they relate to the current issues before this committee and the nation. In view of my particular experience as a career military officer serving this nation's defense needs for over 37 years, I will focus my remarks on the importance of ethics and integrity in the military leadership of this great country of ours.

For the past two years, I have been the full time occupant of the Distinguished Leadership Chair at the United States Naval Academy. This Chair is endowed by the private donation of one of the Academy's alumni and therefore my remuneration is not paid for with government or taxpayers dollars. I spend my time teaching ethics three days a week, leadership two days a week, and participate in a Brigade wide Integrity Development Program once a month.

This is an indicator of the relevance and importance placed on these subjects by those charged with developing the ethical based leadership required by our officer corps. While I provide this information as a background, I appear before you today and make this statement as a concerned individual citizen and retired military officer; not as a representative of any organization with which I am currently affiliated.

We live in a society that more and more is transmitting a confused message on the subject of ethics and integrity, which makes one wonder if we are losing our way. In our last Presidential election, both candidates emphasized family values, one wanted two parents to be the center of the family responsibilities. The other felt it takes a village of caring people to raise our children; it seems to me both were right. When we look in the window of the American society to see how we are doing, the picture is not too comforting. Approximately one out of four babies born today is illegitimate and 25 percent of all children are being raised by a single parent. Even in the declining base of our more traditional

two parent families, both parents routinely work full time jobs. It often appears we are more interested in raising wealth than our children. Consequently, TV viewing is up 60 percent among our children and scanning the Internet, not reading the classics, is a close second.

Those interested in leadership and ethics development must ask this question. What ethical messages are our children getting from many afternoon TV talk shows as well as the prime time violence and comic titillation on TV in the evening. Now this same material is easily available on the Internet. Recent survey's indicate 70 percent of college students admit cheating at least once. You can buy books on How to Cheat and Succeed in most off campus book stores. The suicide rate among teens is up 11 percent in the last five years. Crime and drugs remain dominant factors in our cities. More interesting is the fact that 50 percent of our crime involves employees stealing from employers. These are values and lessons of life that are getting transmitted to our youth. It is often a message that subtly implies *so what if it is wrong, everyone is doing it*. This is the background from which our entry level enlisted and officers are coming from.

Faced with this reality, the armed forces have concluded, all personnel must be inculcated repeatedly with the requirement and expectation that military leadership must evolve from a foundation of trust and confidence. The ethics and integrity of our military leadership must be much higher than the society at large and even the elected officials that serve that society. Success in combat, which is our business, depends on trust and confidence in our leaders and each other. Ethics and integrity are the basic elements of trust and confidence in our military leadership, both from above and more importantly, from below.

While the requirements for successful military leadership are clear, it is also clear we do not always meet these standards. At the end of the Gulf War, just seven years ago, our military and its leaders stood at the pinnacle of professional performance and public esteem following the dramatic successes in the Gulf War. We led everyone's list of those for whom the public had trust and confidence. Since then we have had Tailhook as a watershed event.

There have been serious sexual harassment and ethical behavior charges in all the services, many involving very senior leadership

that have resulted in more than a dozen flag officers being removed from office for violations of integrity and ethics. The issue of chemical weapons exposure in the Gulf War raises questions concerning straight talk if not the integrity of the leadership with regards to our troops and the public. Leadership within the Army has been tarnished by Skin Head racial incidents at Fort Bragg, the revelations at Aberdeen, and the alleged abuses of the former Sergeant Major of the Army. The tragic shoot down of friendly helos in Northern Iraq as well as several Navy and Marine air accidents also raised questions of confidence and integrity in the military training process. The Naval Academy had the EE Cheating Scandal in 1993-1994 plus a few highly publicized incidents of drug use and car thefts by members of the Brigade. The Marine Corps had cheating on exams at the Officers Basic School, the publicized tradition of blood pinning and the recent relief of a commander in the field for apparently advocating the destruction of any films documenting routine failures in flight discipline.

Unfortunately, I could list more examples but the message is our house does not look in order on the issue of ethics and integrity, no matter where you look—from the White House to the house next door. Whenever these disconnects between our standards of behavior and our actions occur the solution is not to lower our standards. Rather we must maintain the standards and improve our performance while holding those who fail accountable.

In the military profession, a breach of your integrity, ethics or honor is always accompanied by a leadership failure. The bottom line for our military leadership requirements is that integrity and ethics cannot be taken for granted or treated lightly at any level of training or interaction. All our personnel must be inculcated repeatedly with the requirement that military leadership must evolve from a foundation of trust and confidence in our ethics and core values of honor, courage, and commitment to do what is right.

Today we are asking our people, What is right? Why do what is right? The moralist answer is because it is the right thing to do. Our answer is because the trust and confidence required of our profession demands it.

Doing what is right based on the whole truth must be natural and automatic for the American military officer. We need to clearly identify our core values and repeatedly reenforce them

among all members of the armed forces so that they become second nature.

Whenever one reflects on the need for ethics within the military profession, as executed by those who have the privilege of leading the American Soldier, Sailor, Airman, Marine and Coast Guardsman in the duty of defending our national security interests, I believe it is necessary to reflect on the roots of our nation. For it is there where the higher calling of this nation, some call it a moral purpose that we serve today, began. Some current day thinking would have us believe that those who espouse a bridge to the past have no vision. I submit if the vision of the present is missing the values that this nation was founded on, we should strengthen that bridge to the past for it is built on the lives of those who fought and gave the ultimate sacrifice for those principles and beliefs.

While there are many effective styles of leadership, two essential ingredients of successful military leadership are integrity and ethics.

Rank and high positions do not confer privileges; they entail unavoidable responsibilities and accountability. Young Americans in our military place their leadership on a pedestal of trust and confidence when we earn it.

They have the right to expect unfailing professional performance and integrity from each level of leadership. Military leaders at all levels, need to consistently display that match between words and deeds, between rules and compliance, between institutional values and behavior. The catch is this match must take place 24 hours a day, there is no duty and then off time where you can let your hair down and not represent these core values. There can be no compromise on this issue in a profession where the ultimate you can demand of a subordinate is that they lay their life on the line in the execution of your orders.

When all is said and done, military leadership must have a moral base, a set of ethical values, to keep us true to the high ideals of our forebearers who provided us the cherished inheritance of freedom. The integrity of an officer's word, signature, commitment to truth, discerning what is right and acting to correct what is wrong; must be natural, involved and rise to the forefront of any decision or issue. Leadership by example must come from the top, it must be consistently of the highest standards and it must be visible for all to see. Do as I say and not as I do just won't

hack it! This country is firmly entrenched in the principle of civilian leadership of our military in the authority of the President. Therefore, those who hold that leadership position, to be credible, must meet the same standards.

America and her Armed Forces have always stood on the side of right and human decency. You do not throw these core values away in the process of defending them. You also do not lower the bar of ethical standards and integrity when individuals fail to live up to them. We must continue to remove those who fall short and seek those who meet and exceed the requirements. Dual standards and less accountability at the top will undermine the trust and confidence so essential to good order and discipline as well as mission success. The fact is, core values for military leaders and their civilian Commander in Chief remain in effect no matter where they are or what you are doing 24 hours a day. When observed by anyone, they must reflect the institution's core values of respect for decency, human dignity, morality and doing what is right, in or out of uniform, on or off duty. I believe that ethical men and women have a conscience that warns you when you are about to cross the line from right to wrong. The true test of integrity for the ethical leader is doing what is right when no one is watching. He or she knows and that is all that is required to do what is right. Unfortunately those few senior military and civilian officials that bring shame on themselves, their families and their country by ethical indiscretions were probably doing the same thing as more junior officials. It was not newsworthy then, but it was just as wrong. If in these cases the leader chooses to lie or otherwise avoid his/her responsibilities, the continuation of that military leadership is adverse to morale, good order and discipline and eventually combat effectiveness. As has been said on many occasions: "Habit is the daily battleground of character."

I agree with Stephen Crater's three requirements for ethical action on issues of integrity.

1. Discern what is right and what is wrong based on all the facts and the truth. This takes pro-active involvement not selective avoidance.
2. Then you must act on what you discern to be wrong, even at personal cost and, I might add, the corrective action must be effective.
3. Openly justify your actions as required to meet the test of

right and wrong.

Under this clear definition, whenever an individual or collective breakdown in our core values is observed, immediate corrective action must be taken. There are any number of courses of action available and the best one will depend on the circumstances at the time. What is never acceptable is the toleration of observed wrong actions or the acceptance of an environment that allows wrong actions to occur. To allow this is a fundamental breakdown in the integrity of the leadership responsibilities and trust placed in the acceptance of one's oath of office. Above all else, military leadership is a commitment to seek out responsibility, to understand and accept accountability, to care, to get involved, to motivate, to get the job done right the first time, through our people. Mistakes will happen and can be corrected, usually with a positive learning curve. The cover up of mistakes and responsibility by lying or obfuscation cannot be tolerated. The leadership of our Armed Forces must be based on principle, not litigious double talk. Thus the leadership traits of our military as well the civilian leadership of the military must demonstrate above all else, a commitment to integrity and ethics on a daily basis. This must be most visible at the top, if we as a nation are to meet our constitutional responsibilities to *provide for the common defense* now burdened with the mantle of world leadership.

In closing, I offer the following summary observations: On Ethics and Military Leadership

- We must learn from our past mistakes, but we must get on with the business at hand and focus on the future not our wake. We have a cadre of young leadership in our armed services that makes me confident for the future.
- Ethics and Integrity essential for successful military leadership starts at the top. In our country the top military leadership is subject to duly elected civilian authority specifically empowered in the Office of the President of the United States.
- Military Readiness and Mission Accomplishment Depends on Trust and Confidence in the Integrity of the Leader.
- Actions of the leader are more important than words.
- It is important for those you lead to know what you stand for and equally important what you won't stand for.
- Loyalty down is just as important as loyalty up.

- Regardless of what the exit polls imply, the character of a nation and its leaders does matter and it matters most to those who are prepared to lay down their lives for that nation. Those entrusted with the defense of our nation are in a risk taking business. If we ever become risk adverse because the integrity of our leadership is in question or even perceived to be in question, we all lose.
- Finally, our leaders must *eschew obfuscation* in all we do. Our national leaders must talk straight and with integrity on every issue. If we lie to ourselves as an institution or as individuals within that institution, we are laying the seeds of our own individual and national destruction.

Thank you for the privilege of addressing this committee on these important issues.■

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CORE OF NAVAL OPERATIONS: STRATEGIC AND OPERATIONAL CONCEPTS OF THE UNITED STATES NAVY

by CDR Sam J. Tangredi, USN and
CDR Randall G. Bowdish, USN

[Editor's Note: In the political debate that constitutes defense policy of our democratic nation, it is important periodically to articulate the unique contributions that naval forces make to national defense. The following article develops a method for defining the functions of today's Navy and provides a conceptual template from which decisions for future force structure could be made. The authors are members of the Strategy and Concepts Branch of OPNAV; however, the views expressed are their own and do not necessarily reflect the official position of the Department of the Navy.]

The United States Navy is built on action, rather than intellectual debate. It is our historical success in defeating our enemies and maintaining the peace that endears the Naval Service to most Americans, not the logic or intellectual rigor of our operating concepts and doctrine. Most Americans are simply not aware of our concepts or doctrine. Yet, the logic of our concepts—in other words, our common professional view of the missions of the Navy—is indeed the cornerstone of our current force structure and our future programs.

The famous Yiddish proverb, "If we don't know where we are going, any road will get us there—but it may be the wrong *there*" applies to organizations that lose sight of their core ideology or fundamental concepts. As we enter the new millennium—a period in which popular focus on the *new* seems to give credence to the latest intriguing *buzz-word* in defense policy—it seems doubly important that we can define ourselves in the language of simple, straight-forward and enduring concepts.

Challenge and Attributes

Success is the greatest challenge to articulating the need for a powerful, 21st Century Navy. We have been so successful as a Navy that it is as easy for the American people to take our

capabilities for granted as it is for us to take public support for granted.

The United States is truly the premier transoceanic power in the world.[1] In the course of modern history, no Navy has enjoyed such a preeminent maritime position as the U.S. Navy does today. It is unlikely that we will face a naval peer competitor within the next twenty years. The very size and power of America's fleet discourages rival investment in what can be described as our dominant market share.

Unfortunately, the public result is that the purpose for having a transoceanic Navy—one that can influence events in far-off lands—becomes obscured. Critics portray the Navy as an "obsolete force" whose force structure is based on "faulty rationalization" and whose missions could best be done by land-based airpower or garrison army forces.[2] These critical arguments compound the pressure on operating resources that resulted from the decision to down-size defense following the end of the Cold War. But much of the smoke of obscurity—and many of the critical arguments—can be blown away through a patient explanation of the strategic and operational concepts that are at the core of world-wide naval operations, and that are evident in the attributes of today's Navy.

Today's United States Navy can be characterized as a ***full-spectrum*** **Navy, capable of shaping the international environment and responding to crises.** In the words of the Chief of Naval Operations, Admiral Jay Johnson, the U.S. Navy is capable of influencing events "anytime, anywhere."[3] It has also become a *joint* Navy, capable of a high level of interoperability with forces from other Services and other government agencies, as well as in its traditional partnership role with the United States Marine Corps.

In terms of specific attributes, today's United States Navy is a ***Forward Presence Navy*** —with roughly one third of the fleet forward deployed on operations around the globe on any given day.

It is also a ***Deterrent Navy***—in both a strategic nuclear and conventional sense–with strategic ballistic missile submarines providing survivable, sea-based deterrence against nuclear attack, and conventional forces providing notice of American commitment and resolve against other potential acts of aggression.

Likewise, it is a ***Power Projection Navy***—with a capability unmatched by any other nation on earth, from Tomahawk strikes hundreds of miles inland to aircraft to landing Marines ashore.

And it is a *Sea and Area Control Navy*—with a capability to seize control of a littoral region and maintain control of the sea and the airspace above it.

These attributes are not accidental reactions. Although not always publicly articulated in such a format, the four *strategic concepts* highlighted above (Forward Presence, Deterrence, Power Projection, and Sea and Area Control) have acted as the intellectual core around which current naval forces were built.[4]

For our discussion, we accept the definition that a strategic concept is **a statement of the methods by which a military service implements national policy.**[5] In other words, these concepts represent strategic-level capabilities that Naval forces provide America. While similar in construct and detail to the "mission areas" articulated by Vice Admiral Stansfield Turner in 1974, the strategic concepts are actually derived from the requirements of post-Cold War national security strategy.[6]

These four strategic concepts literally describe the national security *products* the American people receive by *buying* the Navy. They are the unique dividends on America's direct investment in the Naval service. The result has been maritime supremacy with a potential to deter or decide the outcome of military actions on land.

The four strategic concepts are enabled by four *operational concepts* of U.S. naval forces: ***naval fires**, **naval maneuver, cooperative protection,*** and ***sustainment.*** Depending on the particular blend of these four operational capabilities, naval forces can provide the Joint Task Force commanders and the unified Commanders-in-Chief with a flexible set of tools with utility across the spectrum of conflict. The operational concepts describe the *products* that naval forces provide in combat or operations-other-than-war.

Thus, in articulating Navy strategic concepts, we are really describing how we as a Service carry out the current National Security Strategy and National Military Strategy objectives of

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*Naval Fires is defined as "the networked use of sensors, information systems, responsive command and control, precisely targeted weapons, and agile, lethal or non-lethal forces to achieve desired effects, assess damage and reengage when required." As such, Naval Fires incorporate what we have previously called Strike.

Shape, *Respond* and *Prepare Now* within the overall framework of international *Engagement*. In articulating the *operational concepts*, we are describing the capabilities that Naval forces bring to joint warfighting on the campaign level—how naval forces engage the enemy. Together they provide a logical illustration of the defense *products* of the Naval Service.

STRATEGIC CONCEPTS			
Forward Presence	**Deterrence**	**Power Projection**	**Sea and Area Control**
OPERATIONAL CONCEPTS			
Naval Fires	**Naval Maneuver**	**Cooperative Protection**	**Sustainment**

Understanding the breadth of these *products* require an examination of each in detail.

Forward Presence

Forward presence is a term that is at the heart of the expeditionary nature of the Naval Service—we are already present in the regions of potential crisis. Because it appears to be a self-evident function, forward presence—by itself—has not always been classified as a naval *strategic concept*.[7] During the Cold War era, the forward presence effects of the naval deployment cycle were considered a by-product of our readiness to defeat the Soviet Navy in a global war. However, in a multipolar but still crisis-prone world, the absence of a global military threat allows forward presence to be recognized as an individual strategic *concept* in its own right—as a method of implementing the National Security objectives of *Shape* and *Respond*, as well as ensuring that naval forces are *prepared now* for combat operations.

Forward presence is defined by Naval Doctrine Publication 1, Naval Warfare, as "**maintaining forward deployed or stationed forces overseas to demonstrate national resolve, strengthen alliances, dissuade potential adversaries, and enhance the ability to respond quickly to contingency operations.**"[8] Through a Forward Presence posture, naval forces can shape the environment through joint and combined exercises, port visits, military-to-military support, and the psychological reassurance of security that only forces on the scene can provide. Forward presence forces can

improve stability by dissuading potential adversaries from attempting asymmetrical tactics; ensuring freedom of navigation and America's access to the world's littoral regions; and providing a visual sign of our national commitment.

At the same time, Forward Presence is a central enabler to crisis response. The most rapid, sustained response to world events—whether natural disasters, non-combatant evacuation operations, or open acts of aggression—is possible when forces are forward deployed.

Deterrence

Deterrence is defined in Joint Pub 1-02, DOD Dictionary of Military and Associated Terms, as "**the prevention from action by fear of the consequences. Deterrence is a state of mind brought about by the existence of a credible threat of unacceptable counteraction.**"

Since 1949, Naval forces have provided both strategic nuclear and conventional deterrence. Current nuclear deterrence is primarily deterrence by the threat of punishment. SSBNs on patrol remain an essential—and the most survivable—element of the U.S. strategic triad.

Conventional deterrence, however, can be either by the threat of punishment or the threat of denial or both. Deterring aggression by the threat of denial requires a belief by the potential aggressor that intervening forces actually possess the capability to prevent him from achieving his objective.

Forward-deployed, combat-credible naval forces provide potential aggressors with a visible reminder that they can be denied, if the United States so chooses. New technologies, such as Theater Ballistic Missile Defense (TBMD), promise an even greater potential for deterrence by the threat of denial.

Whether by threat of punishment or denial, deterrence ultimately depends upon credibility. Credibility is defined as *capable of being believed*. In the case of strategic deterrence, the fact that our SSBNs are operating unlocated in the depths of the ocean give them a credibility for survival that land based systems simply do not have. In a sense, they are the forward deployed leg of our strategic triad.

There is a direct linkage between forward deployed forces and deterrence. Forward deployed naval forces are a deterrent to potential aggressors by virtue of being on stage and ready (visible

or invisible, but present and secure), a combat credible threat to potential aggressors. At the same time, the potent Power Projection capability of naval forces, as necessary to warfighting as deterrence, provides the credible threat that transforms the perception of deterrence into reality.

Power Projection

Power Projection was codified as a primary Navy strategic concept in the 1970's with the publication of NWP 1, Strategic Concepts of the U.S. Navy. Since then it has remained the cornerstone of naval strategic concepts--it underpins the efficacy of naval forces to act across the spectrum of conflict. Whether in the form of a carrier-based strike, an attack by a Marine Air-Ground Task Force, sea-launched cruise missiles, or clandestine Special Warfare Forces, naval forces harbor tremendous warfighting capability. But, the Power Projection capability of naval forces also is central to its peacetime missions. In addition to being the credible threat behind deterrence, the ability to project power also provides means to make good on assurances of U.S. commitment and resolve.

Power Projection is currently defined in Naval Doctrine Publication 1, Naval Warfare, as **"The application of offensive military force against an enemy at a chosen time and place. Maritime power projection may be accomplished by amphibious operations, attack of targets ashore, or support of sea control operations."**[9]

The full-dimensional Power Projection capability of naval expeditionary forces, coupled with Forward Presence, is a key component of the U.S. Strategy of Engagement. Naval forces are able to shape the international environment by deterring aggression and promoting stability, by maintaining alliances and by building coalitions through defense cooperation and security assistance and enforcing sanctions. The combination of Forward Presence and Power Projection is also important in the response to crises. Forward-deployed, combat ready Naval Expeditionary forces can protect American citizens by conducting noncombatant evacuations from unstable nations. Likewise, they can help keep the peace between antagonistic factions.

However, the Navy-Marine Corps Team--while a powerful combination able to project power in response to a wide array of crises--will not go it alone when it comes to Major Theater War

(MTW). After making the initial entry, Naval expeditionary forces will maintain access for follow-on Army and Air Force components. To do this, naval forces will need to establish Sea and Area Control.

Sea and Area Control

Sea and Area Control is defined as **"the ability to dominate sea and air lanes and then to defeat a foe's littoral, sea and air capabilities throughout a broad theater of operations."**[10] During the Cold War, Sea Control was also codified as a Navy strategic concept in NWP 1, with the understanding that it was a prerequisite for effective Power Projection.[11] The term "Area Control"reflects the ability of naval forces to control the littoral region—that area of land adjacent to the sea.

The ability to project power depends upon having some degree of Sea and Area Control. The majority of troops, equipment and supplies will travel to a region of conflict by sea—dependent for safe transit upon the United States Navy's control of that sea. Even with the enormous amount of airlift capacity enjoyed by the United States in preparation for Operation Desert Storm, over 90 percent of the war material was transported by sea.

Attaining Area Control means ensuring access and overcoming any potential area denial threat. Area denial capabilities include traditional sea denial weapons such as mines and shore launched aircraft and cruise missiles. However, weapons of mass destruction and ballistic missiles are also being added in some area denial arsenals. Rogue nations will be seduced by the attractiveness of denial or *anti-access* strategies as a means of foreclosing intervention in the conduct of aggression. While this presents naval forces with a more vigorous enemy defense to overcome, it also means that when it is overcome, naval forces will have achieved a great impact in bringing down a large portion of an aggressor's total warfighting capability.

Area Control is necessary not only in enabling the full complement of Power Projection capability to be focused on the enemy center of gravity, but also in providing force protection. The Navy is fielding a new set of capabilities which promise to bring the vision of *area control of a broad theater of operations* to reality. But the strategic concept of Sea and Area Control calls for more than air and missile defense—it calls for surface, subsurface and information control as well, across the dimensions of water, land,

air, electromagnetic spectrum, and space--reaching from the sea and across the shore to hundreds of miles inland.

The strategic concepts of **Forward Presence, Deterrence, Power Projection and Sea and Area Control** are inter-related. None stands alone. They are interwoven like the threads of a fine tapestry, multi-colored hues that individually give only a partial clue to the picture they ultimately describe in support of national strategy. Forward Presence enables conventional Deterrence. Deterrence requires Power Projection capability to be credible. Sea and Area Control enables Power Projection. If Deterrence fails, Power Projection is utilized. The capability to accomplish each strategic concept must be built into the fleet, not individually, but rather, in a balanced, total force package that provides the nation with a full-spectrum fleet capable of meeting national objectives.

Enter Operational Concepts

While strategic concepts provide the keel upon which naval forces can be built, by themselves they are not enough to define the capabilities desired in the fleet. Operational concepts further define how the Navy will fight. As previously stated, these operational concepts describe what naval forces provide at the **operational level** of warfare or in operations other than war (OOTW).

Through analyzing current warfare concepts, technological developments, and the requirements needed to ensure that naval forces can fulfill the four strategic concepts, we have identified four operational concepts that potentially describe the American way of naval warfare as we enter the 21st Century: ***Naval Fires, Naval Maneuver, Cooperative Protection*** and ***Sustainment***. These four operational concepts are compatible with and are best linked together by the overarching information structure identified as Network Centric Warfare, defined as "warfare which derives its power from the robust networking of a well informed, but geographically dispersed force." [12]

Naval Fires

The goal of **Naval Fires** is to achieve a set of desired effects. While that has largely called for ordnance on target—with modern weaponry reaching farther and increasingly becoming more precise and lethal—the Information Age has unleashed a new weapon, information. Information can be used to deceive an adversary.

Information can be used to confuse and cripple an enemy with indecision and doubt. Information can be used to achieve many of the desired effects attained by conventional munitions, but without necessarily destroying an objective. Just as a Tomahawk strike can take out a critical enemy communications node, information fires may provide a non-destructive alternative as another tool in the warfighter's set of options.

While non-lethal elements of fire—such as information--will increasingly find their way into the naval arsenal, traditional elements of fires will also remain. Marines and SEALs will continue to carry rifles. Submarines will continue to carry torpedoes and missiles. Ships will continue to carry guns and missiles. Aircraft will continue to carry missiles and bombs. The flexibility possessed by having a range of Naval Fires options is required in order to achieve the *right* effect—whether limiting collateral damage by use of precision weapons or instilling shock and confusion with wide area munitions. The way we will employ them, however, could also change appreciably.

Naval Maneuver

Naval Maneuver is defined as "the coherent use of networked, mobile sea forces, dispersed or concentrated, sharing a common operational picture, to gain advantage over the enemy on or from the sea." It is operationalized in fighting doctrine as Operational Maneuver at Sea and Operational Maneuver From the Sea.

The use of the sea as a maneuver area provides naval forces with tremendous tactical, operational and strategic advantages. The mobility and reach of modern U.S. naval forces, equipped with advanced amphibious and strike capability, translates to an ability to strike anywhere in the littorals. The enemy is left to wonder where naval forces will strike, forced to either defend the length of his coastline, spreading his forces thin, or concentrating his forces in critical areas, leaving other areas lightly defended.

Naval Maneuver and Naval Fires are complementary. At times, naval forces maneuver to effect fires. At other times, fires are effected to enable maneuver. But when fires and maneuver are conducted concurrently across the depth of the battlespace against an enemy's center of gravity, they provide a lethal combination punch.

Before naval forces can effect Naval Maneuver, however, they

must have Sea and Area Control, discussed previously. The force protection aspect of Sea and Area Control is operationalized in the operational concept of Cooperative Protection.

Cooperative Protection

Cooperative Protection is defined as "control of the battlespace to ensure joint and combined forces can maintain freedom of action during deployment, maneuver and engagement, while cooperatively defending our forces and facilities at all levels."

Cooperative Protection is about more than self-defense of naval forces. It also means casting a protective umbrella over joint, coalition and friendly forces on land. In the case of military forces, Cooperative Protection enables freedom of action against the enemy. However, Cooperative Protection also has an important political function. Providing protection for a friendly nation, as in the case of Theater Ballistic Missile Defense used as a means to deter by the threat of denial, can have tremendous diplomatic effect against a potential aggressor attempting to coerce a friendly nation with the threat of a ballistic missile attack.

In order to attain Sea and Area Control, naval forces will require a robust Cooperative Protection capability across the dimensions of air and space, extending to the ocean bottom, that reaches well into the cluttered reaches of littorals. The sharing of sensor information to build composite tracks coupled with the capability of any shooter in the net to shoot remotely on those shared tracks—without necessarily having contact itself—will allow optimal intercepts of threats at maximum ranges. In the case of air defense, Cooperative Engagement Capability (CEC) is bringing this capability to the fleet. Theater Missile Defense (TMD) will bring a similar capability to the fleet. In order to achieve a fully cooperative protection capability, however, TMD and CEC must be coupled with undersea and surface capabilities, linked into an integrated capability that delivers control of the battlespace.

Cooperative Protection will work hand-in-hand with Naval Fires. In some cases, protection will be provided by eliminating the threat entirely by Naval Fires. In other cases, either due to a target being unreachable or rendered irrelevant once bypassed, force protection will depend upon Cooperative Protection capabilities.

Sustainment

The sustainment is the key enabler of the Marine Corps' *Operational Maneuver from the Sea* concept and is defined as "the delivery of tailored support and logistics across the spectrum of conflict from the sea."

Sustainment enables forward-deployed forces to remain on station as long as necessary as they shape the international environment or respond to crises. On-scene naval forces, with equipment and supplies resident onboard, can commence support for anything from a disaster relief effort to a noncombatant evacuation operation to the initiation of Major Theater War. Sustained, high tempo operations are made possible by a responsive, world-wide logistics capability. But 21st Century military operations will require a new method of sustainment—no longer a logistics *tail*, but rather, integrated support that meshes fully with Naval Fires, Naval Maneuver and Cooperative Protection.

The Navy plays a leading role in logistical support of the joint force. By means of strategic sealift, the Navy ensures the joint force is able to get to the scene of action and stay the course. Sea-based logistic support of Marines and SEALs ashore allows them to travel fast and light. Sea-based sustainment enables Operational Maneuver From the Sea at mission depths well into the littorals. By keeping the logistics footprint at sea, land forces can operate at high tempo against the enemy without concern for protecting otherwise vulnerable land-based logistic nodes.

Conclusion: Future Opportunity

Maintaining the capabilities required by the strategic and operational concepts in an environment of scarcer defense resource is a challenge. The first step in meeting that challenge is to ensure that these concepts are publicly articulated in a coherent, understandable fashion. *[Editor's Note: This is precisely the object of the Naval Submarine League.]*

The next step, building a 21st century Navy based on the strategic and operational concepts, is even a greater challenge. But along with this challenge comes the unique opportunity of being able to fulfill the ultimate objective of global seapower: to directly control significant events on land. Even Mahan—often accused of advocating seapower for its own sake—recognized that the whole point of developing decisive naval power was to ensure America's

ability to influence those land areas where her vital interests may be challenged. As another prolific naval strategist, Commodore Dudley Knox expressed it in 1932:

> "The supreme test of the naval strategist is the depth of his comprehension of the intimate relation between sea power and land power, and of the truth that basically all effort afloat should be directed at an effect ashore."[13]

In Mahan's day and 1932—and even in the 1974 of Vice Admiral Turner's *mission areas*—the primary difficulty in influencing events ashore was technology. The technology of the day and the need to first defeat opposing fleets limited the Navy's ability to fulfill its full promise. As we prepare to enter the next millennium, the continuing evolution of technology—along with the absence of a significant maritime rival—provides the opportunity. At the core of this opportunity will be the strategic and operational concepts—translating opportunity into results.

NOTES

[1] The term "transoceanic" is taken from Samuel P. Huntington, "National Policy and the Transoceanic Navy," United States Naval Institute Proceedings Vol 80/5/615 (May 1954), pp. 483-493. In Huntington's depiction the purpose of a "transoceanic" Navy is "to utilize its command of the sea to achieve supremacy on the land."

[2] One of the most recent, and most factually inaccurate attacks, is: William E. Odom, "Transforming the Military," Foreign Affairs, 76, 4 (July/August 1997), pp. 54-64.

[3] Admiral Jay Johnson, USN, "Anytime, Anywhere: A Navy for the 21st Century," United States Naval Institute Proceedings Vol 123/11/1137 (November 1997), pp. 48-50.

[4] The components that make up these strategic concepts are often referred to, but rarely explained. One of the most enduring explanations is that of VADM Stansfield Turner, USN, "Missions of the U.S. Navy," Naval War College Review Vol XXVI/5/248 (March-April 1974), pp. 2-17.

[5] This definition is also derived from Huntington's article, but substitutes the term 'method' for his use of the word 'role.' Legislative usage of the word 'role'—subsequent to publication of the article—has given it a very specific and

narrow meaning. Huntington, p. 483.

[6] Significant advances in technology have given naval forces capabilities far beyond VADM Turner's depiction of sea control and power projection. Likewise, the "deterrence" strategic concept has a broader definition than VADM Turner's "strategic deterrence mission," which focussed primarily on nuclear retaliatory strike. VADM Turner, pp. 5-6.

[7] VADM Turner does identify "naval presence" as a mission area. However, official publications of his era describe the contribution of the Navy to America's "forward strategy," but do not necessarily describe naval presence as a separate concept. VADM Turner, pp. 14-15.

[8] Naval Doctrine Publication 1: Naval Warfare, Office of the Chief of Naval Operations/Headquarters, United States Marine Corps, 28 March 1994, p. 73.

[9] Naval Doctrine Publication 1, p. 74.

[10] Navy Long Range Planning Objectives, Chief of Naval Operations Memorandum, 2 Mar 1998.

[11] Naval Warfare Publication 1: Strategic Concepts of the U.S. Navy (Rev A), May 1978, p. I-3-2.

[12] This article does not attempt to describe the linkage of the strategic and operational concepts to network centric warfare. However, network centric warfare would appear to be the optimal enabling architecture to ensure that the capabilities described by the concepts could be achieved in the smaller, geographically dispersed Navy of the future. The best description is:, Vice Admiral Arthur K. Cebrowski, USN and John J. Gartska, "Network-Centric Warfare: Its Origin and Future," U.S. Naval Institute Proceedings Vol 124/1/11-39 (January 1998), pp. 28-35.

[13] Quoted in: Colin S. Gray, The Leverage of Sea Power: The Strategic Advantage of Navies in War (New York: The Free Press, 1992), p. 1.

ASW IS A TOP PRIORITY—IN EUROPE

by VADM J. Guy Reynolds, USN(Ret.)

The Undersea Defense Technology (UDT) Europe '98 Conference was held 23-26 June 1998 in London, UK. Delegates from 24 countries attended the conference. New registrations from Russia pushed the total number of delegates to 490. Ninety-one exhibitors of undersea warfare products from 17 countries covered 1,520 square meters of floor space, an increase of more than 10 percent over the last conference in London. This year's number of exhibitors was the largest since 1994. Visitors numbered in the thousands.

The conference chairman, Captain Patrick Tyrrell, RN, opened the conference with the opinion that submarines remain the "most survivable" naval platform. He further stated that, "...in some respects, U.S. ASW efforts appear in trouble...", further increasing the importance of ASW in Europe. The introduction of Air Independent Propulsion (AIP) submarines is making ASW a top priority.

The opening and keynote speakers focused on the challenges facing the defense industry. In particular, Sir Robert Walmsley, Chief of Defence Procurement, MoD, UK, explored some ideas on smart procurement including the development of cross functional project teams comprising operational, procurement experts, and development scientists together with their defense industry colleagues tasked with looking after projects from cradle to grave.

At the NATO Confidential classified conference on 26 June 1998, Rear Admiral Jonathan Band reminded those present that all efforts were geared to supporting military forces on or under the sea with advanced technology. Six NATO countries presented 26 classified papers including four by U.S. delegates.

Exhibitors displayed wares ranging from entire submarines to simulation software. The proliferation of AIP submarines stimulated considerable interest in active detection equipment including multi-static sonar systems.

Delegates from Australia, Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Israel, Italy, Japan, Korea, Netherlands, Norway, Poland, PRC, Russia, SACLANT, Singapore, South Africa, Spain, Sweden, UK, and the USA attended the conference.

Embassy representatives included individuals from Argentina, Chile, Columbia, Egypt, Greece, India, Indonesia, Malaysia, Oman, Peru, Portugal, Thailand, and Turkey.

In 1999, UDT will return to Nice, France. The dates have been established as 29 June to 1 July 1999.

I have attended every UDT conference over the history of the program. It has evolved from a UK/French show 11 years ago to an international conference. In the last two years, UDTs were held in Hamburg, Germany (July 1997) and Sydney, Australia (February 1998). The product lines exhibited have expanded from torpedoes and sonars to entire submarines and every possible supporting product and service, including acoustic ranges, UUVs, mines and software of every description.

I found the list of embassy representatives interesting. Four or five years ago, the list was dominated by Western European countries. This year buyers from countries with fledgling navies were prominent. Submarines and undersea warfare technology is proliferating. **If the United States is to remain superior in undersea warfare, this is no time to short change supporting research and development.**■

DOLPHIN SCHOLARSHIPS

Dolphin Scholarship Foundation grants are available, on a competitive basis, to high school or college children/stepchildren (unmarried, up to age 24) of: (1) members or former members of the Submarine Force who have qualified in submarines and have served in the Submarine Force for at least 8 years; or (2) Navy members who have served in submarine support activities for a minimum of 10 years. There is no minimum period of service for children of personnel who died on active duty while in the Submarine Force.

Anyone desiring to request an application package should contact: Dolphin Scholarship Foundation, 5040 Virginia Beach Blvd., Suite 104-A, Virginia Beach, VA 23462. Phone: (757) 671-3200; FAX: (757) 671-3330.

Completed applications must be received on premises by April 15 to be considered for the following school year.

OUR RESPONSIBILITY

by CAPT Russell A. Pickett, USN(Ret.)

At the 223rd birthday of the United States Marine Corps I attended our fall meeting of a national retired officers association where our Guest of Honor was Lieutenant General Martin R. Steele, USMC, Deputy Chief of Staff for Plans, Policies and Operations for Headquarters, USMC. Like many speeches given at this Marine Birthday/Veterans Day time of year, considerable credit was given to those of us who served our country over the years. But this speech was different, far more moving and meaningful than most others that I had ever heard. As a recent addition to the rolls of retired of naval officers, I guess I had never really thought what my purpose was in our American society as a former military professional. I had figured that I was just supposed to fade away, marvel at the accomplishments of those that I had trained, attend those military events that I could to relish a little of the life that I had left, and be proud of the service that I had the honor of performing. General Steels made me think differently—I have a greater responsibility.

In the middle of his speech, the General reported that the Marines' vision for recruit training is to assemble a group of men and women of character and turn them into Marines. He raised the question of how to assimilate men and women of character.

He then recalled three recent events in his life that had had a profound effect on him as both a Marine and a human. The first event: While visiting his oldest daughter, a teacher, he had opportunity to play golf at a local course with one of her colleagues. Since they were only a twosome, the starter paired them up with another duo. The others were young, successful businessmen, forcefully showing the wealth they had earned. The General introduced himself to one of the individuals saying that he was a Marine. That individual quickly offered that he thought that there was no more need for a military force in our country, and the money we spent on defense could be better spent on much more worthy projects. He said it in the rude, surly manner of an individual sure of his beliefs and unwilling to listen. The General reported that he then made it his mission for the next four hours to enlighten this individual as to what the service of the military men and woman past and present, had meant and continues to mean to

this great nation. The General said the right words. After the end of the round, that individual humbly approached the General and apologized. He had never thought or believed military people could have meant so much. He asked the General what he could do. The General responded that he should forget the past, and become sort of a disciple of military professionals and their cause.

The second event: As an Arkansas native, he was asked to be part of a career day presentation to a group of more than 3500 Arkansas high school juniors. He asked to go last. During the other presentations, he quickly noted that the students were behaving typically—fidgeting, talking to their friends, not paying attention. And then he spoke. He chose his words carefully. The students listened; they paid attention. They learned about what military service and defense of our country was all about. They were fascinated and bombarded him with questions after the presentation. They had never heard anything like that before. His description of service was not in the history books. In fact, the text they were using only devoted two pages to World War II. While in the corridor following the presentation, a lady approached the General crying heavily, in great distress. He reached out to her and asked her if she was all right. She said no. She reported that she had served as a high school guidance counselor for the past 22 years. During that entire time, she had never recommended that a student join the military. She considered military people pawns of the government and saw no reason for young people to risk their lives. She was married to a Vietnam draft dodger. She now wanted to confess her sins. She promised the General that she would never make another disparaging remark about military service again.

The third event: During his previous assignment on the USPACOM staff, the general had opportunity to travel the Western Pacific extensively. He and his wife had become close friends with the President of the University of Canberra, a sociologist. This scholar believed that western civilization as we know it would succumb to today's regional frailties unless a value based society is preserved. He firmly believed that there were not enough Americans in uniform to make this preservation possible.

So what do these events have to do with responsibility? With our military service? With our duties as Americans, retired from the military? To build these men and women of character for our

military service, the General called on us to be a part of the construction of this character—to tell our story of service to our young people and others that will listen. Our youth needs to be exposed to our heroes of the past, especially those who served in World War II, whose numbers and therefore experiences are all too quickly passing away; the people that guaranteed our present day freedom and peace. I was taught long ago by some wise commanding officer that our only legacy as a military person serving in peacetime was those people that we trained and left behind. I now realize that training of others about the meaning of service to our country can never cease. For if it does, that sociologist may be right—our current military cadre may not be sufficient to save our democracy. I have a responsibility■

ADMIRAL ARLEIGH BURKE LEADERSHIP FOUNDATION

For diverse reasons, many of today's youth reach physical maturity without learning or embracing the core values of accountability, commitment, initiative, integrity, or responsibility. Positive role models are scarce, but the need for them has never been greater. Instead, our daily lives are bombarded by negative messages. One can't pick up a newspaper or news magazine, or turn on a radio or television set without witnessing examples of unnatural disasters—road rage altercations, robberies, embezzlement in the workplace, hit lists in elementary schools, young people resorting to violence as an acceptable way of dealing with their problems, and countless more.

Against that backdrop, a small group of senior naval officers and businessmen formed the Arleigh Burke Leadership Foundation to produce instructional leadership materials consistent with Admiral Burke's ideals of integrity, leadership, and service. Using the life experiences of Admiral Burke and other national and international leaders as examples, the Foundation will produce a series of multimedia videos and classroom instructional materials designed to attract, inspire and motivate today's youth on the intrinsic value of possessing these traits.

The Chairman is VADM Joseph Metcalf III, USN(Ret.) and will operate as a 501(c)(3), non-profit, educational corporation.

The Foundation is currently seeking significant underwriting support. Address your inquiries to the Arleigh Burke Leadership Foundation, c/o U.S. Naval Academy Alumni Assn., 247 King George St., Annapolis, MD 21402-5068, (410) 263-4448, ext. 105.

A LETTER TO U.S. NAVAL INSTITUTE PROCEEDINGS

by RADM Robert R. Fountain, USN(Ret.)

Reprinted with permission from the October 1998 issue of the U.S. Naval Institute Proceedings. (See M. Bradley for the original article, pp. 30-38, July 1998; and other comments by P. Bowman, p. 12, August 1998; and J. Marshall, p.24, September 1998 Proceedings.)

Re: "Why They Called The SCORPION 'SCRAPIRON'"

I am amazed, dismayed, and disappointed with this article, which relies extensively on questionable secondary sources, trades heavily in speculation, and includes much material of little or no relevance to the subject.

I served two separate tours of duty in SCORPION (SSN 589). During my 54 months as a member of SCORPION's crew, I served with nearly all of the officers and crew members ever assigned to the ship. I was the last officer transferred from SCORPION, departing in early January 1968, under five months before her loss.

Contrary to the tone of subject article, SCORPION was highly regarded by her crew and throughout the force. During the prospective commanding officer/prospective executive officer (PCO/PXO) course I attended, along with about 20 others, prior to assuming duty as executive officer of SCORPION, the PCO instructor informally posed the following question: Which submarine of the force, if they had their choice, would the members of the class most desire to command? More than half the class chose SCORPION, despite the fact that newer submarines were then coming on line. Never do I recall a crewman referring to her as "Scrapiron," even though young sailors like to play with words and names. Certainly that appellation was not so common as implied by the title's "they". Were she still with us, I would gladly go to sea with that submarine and crew today.

The author implies all sorts of dark secrets relative to SCORPION's material condition on the eve of her loss. The author asserts that SCORPION's safety systems were neither working fully nor certified. This is a canard. When SCORPION deployed, all of her safety systems were operating as designed and as she had operated safely for the previous eight years.

When she completed her last overhaul, the new SubSafe systems had not been fully designed. Consequently, her normal operating depth was restricted as an additional measure of peacetime conservatism. If, as many of us believe, her casualty occurred at periscope depth, even that would not have been germane.

The author states that the Navy instituted the SubSafe Program in the wake of the loss of THRESHER (SSN 593) to combat criticism and regain prestige. To insinuate such crass motivation on the part of the Navy's senior leadership is typical of the tone of the author's thought. Although I was a relatively junior officer at the time, there is no doubt on any score that this mammoth and costly redesign, reexamination, and repair effort was undertaken only with the safety of the submarines and their crews centrally in mind. Any concern for criticism or prestige was fifth order at best.

The author alleges chronic problems with the ship's hydraulics, and cites an incident in which the ship "corkscrewed violently," stating that this problem remained unsolved. That is not true. It had nothing to do with hydraulics nor with the ship's control surfaces, and was fully resolved before I left the ship. In firing a large number of wire-guided exercise torpedoes while undergoing training, a large quantity of expended torpedo-guidance wire became wrapped around the propeller shaft and entangled in the external shaft bearing. The resulting imbalance caused a pronounced "humping" and caused us to limit our speed on the return trip. When divers were unable to clear the wire from the bearing it necessitated the "emergency [i.e., unplanned] dry docking." A routine inspection of the hull in the course of that short period in dock revealed a rather extensive surface cathodic corrosion of the after hull area, which Commander Slattery correctly requested be attended to upon the ship's return from the Mediterranean deployment.

The author states that on 16 February 1968, departing from Norfolk for the Med, SCORPION "lost more than 1,500 gallons of oil from her conning tower". This statement is suspect. Since the only oil in the conning tower (sic) is hydraulic oil for the operation of the ship's periscopes, masts, and fairwater planes, presumably it is hydraulic oil to which he refers. Fifteen hundred gallons approaches the ship's entire storage capacity for hydraulic oil. Still a large number, it sounds as if that may have been the accumulated loss over the four plus months since the ship had completed a

reduced availability (RAV), during which several large hydraulic leaks were repaired.

In supposed evidence of SCORPION's poor material condition, the author cites "109 work orders still unfilled." No doubt this number is derived from her routine work order list transmitted to her parent tender in Norfolk on departure from the Mediterranean. This number is by no means excessive for a ship returning from a three month deployment where limited external support was available. The work orders typically would have run the gamut from replacement of small nameplates to assistance with repair of a pump, none beyond the ordinary. Despite this, the author casts doubt upon the veracity of the Chief of Naval Operations when he states SCORPION had not reported any [operationally limiting] mechanical problems nor was she headed home for any [nonroutine] repairs. The author seems unaware that every ship at any point in time has an accumulation of minor mechanical problems that in no way limit the ship's capacity to safely operate or perform its mission.

The author totally misunderstands and misconstrues SCORPION's 1967 RAV. Opinion was widespread in the force that submarines were spending an inordinate amount of time in overhaul, and that the intervals between overhauls were far too short. While in need of a replacement reactor core by 1967, SCORPION'S overall condition was so good that the ship itself proposed deferment of overhaul and accomplishment of the core removal during a restricted shipyard availability. Inasmuch as this proposal fit nicely into the larger matrix of overhaul concerns, it was supported right up the line. Both the ship and the shipyard, in their inexperience with core renewals, underestimated the task and were chagrined when the overall RAV lasted five months rather than the scheduled three, but this was still lightning fast. The ship's crew worked hard to provide the necessary support for core removal, to complete all the routine tasks required during infrequent dry dockings, and to accomplish the additional repairs and maintenance opportunity afforded. The ship emerged from this RAV without having lost its operational edge—as typically was the case after long shipyard overhaul—and was ready to resume operations at a high level soon thereafter. Far from discrediting the concept, the interim RAV between extended interval overhauls forms the basis of present-day submarine overhaul policy.

I cite one more example—the December 1967 incident involving an exercise torpedo that had been activated but did not fire. Far from "sidestepping disaster before it could detonate," the unit was later routinely impulsed from the torpedo tube in a carefully planned evolution while sitting alongside the ship's parent tender in Norfolk.

The author attempts to raise doubt and create controversy by blurring the timeline between the original Court of Inquiry, Dr. John Craven's subsequent acoustic and initial debris field analysis, and the still-later Structural Analysis Group (SAG) reviews. He treats the findings of each as competing opinions rather than recognizing that each built upon its predecessor as more information became available to the analysts. I testified before the Court of Inquiry, participated to a degree in Dr. Craven's assessment, have examined photographs of the debris field, and have read the most recently declassified reports of the SAG. I am quite comfortable with my understanding of the operational parameters surrounding the ship's loss. I do not hold myself out as the Navy's authority on this tragedy, but I am content with my own hypothesis, which is fully consistent with the facts as I know them. I agree that, as the Navy has long maintained, the absolute cause and sequence of events will remain unknowable. Above all, I believe in the total veracity and best efforts of the Navy in laying out the facts surrounding SCORPION's loss as best they are known.

I very much regret the mistrust, inaccuracies, and distortions being given currency by irresponsible conspiracy theorists writing for such journals as the *Seattle Post-Intelligencer*, the *Houston Chronicle*, and yes, the Naval Institute *Proceedings*. You have sullied your reputation by publishing such tripe, and I regret the pain that you and others of similar stripe have undoubtedly caused the families of SCORPION's crew by raising new questions or suspicions to disturb their already uneasy peace.■

IN MEMORY OF SCORPION

by The Honorable Robin Pirie
Assistant Secretary of the Navy
Address at the SCORPION Memorial
Naval Base Norfolk, VA, May 1998

We can all remember where we were at the time of great or stunning events. I remember Pearl Harbor Day vividly, for example, and VE and VJ Days, the day President Roosevelt died, and of course the day that President Kennedy was assassinated. On that day I was in the SCORPION office at Charleston Navy Shipyard, and someone, I think Luke or Charley Bing, came in to say the President had been shot. On the day we learned THRESHER had been lost during sea trials I was in SCORPION's wardroom when then Commander Kaufman, the CO, came in to say that THRESHER was down. And I remember all too vividly when Ray Jones called me in my Pentagon office to say that SCORPION had not made her scheduled arrival at Norfolk, and was presumed lost. I remember the tremendous feeling of grief and loss, and pain for the families waiting for the ship that did not return.

It's right that we should remember the grief, and feel again the loss. But it is also right that we should celebrate those 99 brave Americans, what they were a part of and what they accomplished. They were a part, a very important part, of a great enterprise, one that culminated in one of the most remarkable events in history—the victory of the United States in the Cold War, and the dissolution of the Soviet Union.

Even now, only eight years after the event, people are already beginning to forget just how serious the threat was during the Cold War, and how seriously we took it.

Eight years ago I had the honor of addressing the graduating class of Severn School, some 40 years after my own graduation. Gratification at merely being around to do such a thing was certainly in my mind, but it was also an opportunity to contrast the world of 1990 with that of 1950. I reminded my audience that 1950 was a fairly somber time. The Cold War had been joined in earnest. The struggle between the two great world systems, capitalism and communism, dominated the international scene. Communism seemed to have special appeal to developing countries,

many of which were emerging from colonial rule. The failure of capitalism during the Great Depression was still fresh in many minds. Militarily the Soviet Union possessed awesome land forces, and had demonstrated the previous year that it could produce nuclear weapons. And of course the Korean War was to breakout that summer. It seemed to many people at the time that the tide of history was on the side of the USSR. Almost everybody believed that war between the superpowers was inevitable, and that when it came it would be nuclear, violent and destructive beyond all human experience or imagining.

Against the threat of the spread of communism and ultimate domination by it, the United States developed a strategy of containment which had political, economic and military aspects, we developed a system of alliances, and pursued containment with what must be acknowledged to be remarkable steadfastness and success. But that success was not easily won, and was never assured. We would do well to reflect on how we felt during the Berlin blockade, or the Cuban missile crisis, or when the Soviets detonated a 100 megaton nuclear device. Concern is putting it mildly.

Of particular concern was the Soviet submarine force. In 1950, when I graduated from Severn, it was being reported that Stalin, drawing conclusions from the World War Two Battle of the Atlantic, planned to build 1000 submarines. Our own Navy responded to the threat implied by this by placing unprecedented emphasis on anti-submarine warfare. The initial thrust was to press forward with concepts that had been successful in World War Two, such as maritime patrol aircraft, hunter-killer groups, and better sonars and weapons for escort ships. But some thoughtful and innovative people believed that our submarines should have a role in this battle, and began developing sub versus sub doctrine, tactics and weapons.

Stalin died in 1953, and the great 1000 submarine threat never materialized. But what did happen was that the Soviets began experimenting with a wide variety of submarine applications. In 1952 they began work on their first nuclear powered submarine, well ahead of our intelligence estimates. They also began investigating ways of launching missiles, both ballistic and cruise, from subs. This work went on through the '50s and early '60s. Their first SSN began operating in 1958. By this time they had devel-

oped missiles that could be launched from surfaced submarines, and testing of these systems was in progress.

Meanwhile, we had commissioned NAUTILUS, had begun to build several classes of SSNs, had developed sonars and torpedoes that were the beginnings of an ASW capability, were developing both diesel and nuclear boats to deliver the nuclear Regulus missile, and had started on the Polaris program and the George Washington class of SSBN. Many of you here recall those days, and the frenetic activity involved, the long deployments, the long hours of work in port, the unscheduled absences. There was a standing joke that if you saw the paymaster on the pier when you came to work, you knew just what you'd be doing for the next 60 days.

The Cuban missile crisis was clearly a watershed event for the USSR. Not long afterwards we began seeing signs of activity that indicated what we now know was a determination never to be in a situation of vulnerability and inferiority again. By the late '60s and on through the '70s the Soviets deployed an astonishing array of weapons systems, mainly nuclear, at rates and in numbers that were frightening. Once again, it is useful to think back to that time. On land they engaged in a massive deployment of ICBMs. They developed MIRVs well before we thought likely. And at sea they produced massive numbers of SSNs, SSGNs, and SSBNs, the latter being characterized by one Secretary of Defense as coming on line like cookies out of a bakery. From my vantage point then on the NSC staff and in the Office of the Secretary of Defense, it was clear to me that our top national leadership was very concerned about these developments. And at home the Vietnam War had taken resources from our own advanced development programs, and made meeting the Soviet threat at sea a major challenge. By the end of the 1970s all our military forces were run down and demoralized, with the Submarine Force perhaps least so, but facing daunting challenges.

Historians will no doubt debate into the indefinite future how we got to where we were in 1980, why the turnaround happened, and when the Soviet Union began to come apart at the seams. What we do know for sure is that the defense buildup of the 1980s will be remembered as a monument to President Reagan, and that it dramatically changed the terms of the competition. Within the buildup, two major elements seem to me to have stood out in

bringing the Soviets to see that they could not win the competition in any meaningful sense, and that they were destroying their country by trying. These were the strategic defense initiative, and the maritime strategy.

People have raised lots of issues and objections to ballistic missile defense. Certainly it is a rich and complex enough subject that those so included can debate it interminably. For me, three things stand out: that the Soviets were convinced we could do it, that there was no world in which they could match us at any price they could afford, and that it scared the hell out of them. They stood to lose the effect of their huge investment in ballistic missiles, and be essentially-disarmed. They couldn't stand it.

I'd like to say a little more about the maritime strategy because it is more important to my main point. For much of the period between the end of World War Two and the end of the Cold War, the Navy and Marine Corps were viewed as bit players and supporting actors in any global war. Their role in projecting power and influence in peacetime was acknowledged, but in global war many believed that the whole stakes of the war rested on the air-land battle for Central Europe. If we lost that, the game was over. Furthermore, the Navy and Marine Corps had little direct relevance to that battle, since they didn't have the heavy land and air forces needed.

I don't need to tell this audience that that thinking was narrow to the point of silliness, but we remained locked in that conventional wisdom until the maritime strategy was developed. That strategy held essentially that the Soviets had vulnerabilities that could be exploited by action from the sea. Time and other factors don't allow me to talk about all of them, but there is one that is particularly relevant. It was clear that the Soviets had put an enormous investment into their SSBN force, and that it was very important to them. Some even argued that SSBNs contained the reserve of strategic force that was the guarantee of their retaliatory capability. If that hypothesis was correct, it meant that Soviet SSBNs protected the very core values of the Soviet state. Putting these ships at risk would give U.S. forces enormous leverage, in war or in peacetime. The task of developing this option was assigned to the Submarine Force.

I won't belabor the point, but history shows that the Submarine Force met that challenge with flying colors. The superb compe-

tence, the dazzling array of technical devices and methods, and the deep experience of our Submarine Force did the job. As in the case of ballistic missile defense, the Soviets were convinced we could do it, and it contributed materially to the collapse of their will to continue the superpower struggle.

The point I want to make here is that the awesome capability our Submarine Force was able to bring to that challenge didn't happen overnight. It was the product of long years of development; practice and plain hard work; of trying to do things with diesel subs we wouldn't try with an SSN today; of pushing edges of the possible everywhere; of testing systems, ships and people in long, arduous deployments. SCORPION was part of that long, hard, and ultimately successful effort.

So it is not just that those 99 Americans died in the line of duty. They did so in supplying the indispensable foundation for the maritime strategy, and hence the defeat of the Soviet Union after 45 years of Cold War. Wherever they are, SCORPION's crew can sing hymns of victory, and can rest easy, knowing they have served our beloved country well. Our friends and shipmates, fathers, sons, brothers and husbands, are an imperishable part of the history of our country, and their illustrious service will be remembered always.■

IN MEMORIAM

Mr. Clay D. Blair
CAPT James F. Caldwell, Sr., USN(Ret.)
CDR J.W. Chapman, USN(Ret.)
Mr. Leon J. Faso
Mr. Paul D. Penman

"WHERE'S MY GUNBOAT?"
The Time is Now for Trident SSGN

by LT Scott Seal, USN
Engineer Officer
USS MAINE (SSBN 741)(Gold)

Lieutenant Seal's paper won The Naval Submarine League Essay Contest while a student at the Submarine Officers Advanced Course 98050.

An aggressive Third World country decides to launch a military campaign (or possibly a terrorist attack) against the United States. In an emergency session, the United Nations decides that sanctions against that country should start immediately. Based on strong U.S. urging, the Security Council follows with the decision to conduct strikes against that country's military assets. The U.S. President promises a rapid strike with minimum casualties and the U.S. takes the lead on planning and conducting the strike.

In a meeting with his cabinet, the President turns to the Secretary of Defense and the National Security Advisor and starts off by asking, "We've got a gunboat there already, don't we?"

Background

The Trident SSGN concept has been in the works for some time now. It started as an idea to enhance fleet strike capability by using four Ohio class SSBNs that must come out of strategic service within the next few years. Conversion from SSBN to SSGN would be accomplished by modifying 22 of the 24 missile tubes to carry a *six pack* of tactical missiles such as the Tomahawk Land Attack Missile. The remaining two tubes would be modified to support Advanced SEAL Delivery System, the new mini-submarine for driving SEALs to their objective. Conversion costs would be low because relatively little change to the hull, mechanical and electrical systems of the submarine would be required. Rapidly, the concept gained strong support from the submarine community.

Additionally, the Navy was looking at the need for a large capacity strike platform. About three years ago, the surface

community was very seriously considering a new surface ship class that became known as the Arsenal Ship. Along with the readily apparent virtues of such a platform, many questions came up. The biggest was, of course, survivability. Would a battlegroup have to protect it? How much stealth could it have? Can we afford to put all our eggs in such a fragile basket?

In March of 1996, the Chief of Naval Operations, Admiral Mike Boorda, asked Norman Polmar, an established commentator on naval history and current affairs, to discuss the possibilities of a submarine Arsenal Ship. *(Editor's Note: See **THE SUBMARINE REVIEW**, January 1997, p. 7).* Mr. Polmar opined that such a warship would be very desirable due primarily to its inherent stealth. He also discussed other salient points including the fact that submarines can stay forward deployed and on station without the support that surface ships need. Most importantly, he noted that a submarine Arsenal Ship could be made out of a preexisting submarine without designing and building a new class of submarines.

Meanwhile, the Submarine Force, and in particular the OPNAV N87 staff, were working with an unrelated concept that they called Trident SSGN. This concept started when it was apparent that within the next five years, the Navy will have to remove up to four SSBNs (of its current inventory of 18) from strategic service. The driving forces in their removal from service are the Nuclear Posture Review of 1994 (NPR) and the second Strategic Arms Reduction Treaty (START II). The NPR, the only pertinent study in existence regarding U.S. strategic force structure, reported that 14 D-5 capable Trident SSBNs are necessary to provide the submarine leg of the strategic triad. Then, as START II was proposed, the U.S. offered to have not more than 14 SSBNs in strategic service. Although START II has not been ratified by the Russian Duma (their Lower House of Parliament), START III is already being discussed as a remedy to the problems that Russia faces in implementing START II. However, SSBNs in strategic service under START III will not exceed 14 either. To accommodate START II and START III, the U.S. Navy will take four SSBNs out of strategic service one way or another. Inactivating four Trident submarines early gives up enormous capability, especially since Trident hull life has now been extended to almost 42 years. Therefore, the Trident SSGN concept begs consider-

ation.

In December 1997, the Congressionally mandated National Defense Panel recommended "converting one or more of the four Trident SSBNs coming out of strategic service to alternate missions..." The Trident SSGN concept gained support from members of Congress and various defense study programs during this time. Later, in early 1998, as the Navy was working on its budget submissions to the Office of the Secretary of Defense for fiscal year 2000 (Program of Memorandum 2000 or POM 100), the Trident SSGN concept was finally ready. But, due to budgetary constraints, it was not included in the budget submission. Because the Defense Department submits budgets every two years, the next real chance to consider Trident SSGN will come in 2000 when POM 102 is submitted. However, the Navy conducts a Program Review (PR 101) in 1999 that may be an opportunity to fund Trident SSGN. Today, it is still just a concept, not a program.

Capabilities

What can Trident SSGN offer? Here are the basics:

- 132-154 tactical missiles in *six pack* or *seven pack* arrangement using 22 missile tubes
- Dual Advanced SEAL Delivery System (ASDS) placement using remaining 2 missile tubes
- 66 Special Operations Force (SOF) personnel embarked for extended periods
- Up to 100 SOF personnel for short periods
- Nine person lock out chambers for SOF personnel
- Twenty+ years of utility since Trident hull life spans were extended to a total of 42 years
- Ready for advanced missiles—Tactical Tomahawk and Navy Tactical Missile System (NTACMS)
- Surging dual crews would allow one SSGN to remain on station 80 percent of the year
- Two SSGNs could provide 100 percent coverage
- Stealth, endurance, agility, low logistic requirements... (all the traits of subs today)

Bang for the Buck

Each paragraph below is reason enough to pursue Trident conversion.

At approximately $425M per ship for conversion costs (including the refueling overhaul), one SSGN alone is an extremely cost effective strike platform for a theater commander. If one compares an SSGN strike to a typical aviation strike, one missile is much less costly (and much, much less risky) than a billion dollar plane with a human pilot. Our Navy cruise missile assets can be covertly delivered, with a small logistics footprint, anywhere in the world's oceans without any concern for fuel or large supply requirements.

As well, Trident SSGN brings as many TLAMs to an area as all the Tomahawk shooters in an entire battlegroup. One may argue that a battlegroup actually has more missiles, but a surface ship and a battlegroup must carry many defensive missiles, including Theater Ballistic Missile Defense weapons in the future. Thus, only a fraction of surface ship missiles are strike capable. Of course, a battlegroup will have to gain control of the seas and suppress enemy coastal defenses to operate with impunity in the first place, whereas the SSGN will not.

The key point that Mr. Polmar missed entirely was that a submarine is invulnerable to most weapons that can be used against a surface ship. A few years from now, supersonic anti-ship missiles (against which the U.S. Navy has no defeat capability) will be available to any Third World country with a modest military investment. Surface ships will be ineffective in this area until these mobile missile sites are destroyed. Meanwhile, submarines can and will operate with impunity inside the ranges of these shore based defenses.

An SSGN (or two!) in certain high conflict areas of the world would reduce the requirement for many other strike warfare platforms to deploy. For instance, strike operations in the Arabian Gulf require a certain number of capable cruise missiles (vice cruise missile platforms). SSGN presence would fill much of this requirement and improve OPTEMPO across the fleet. Also, it would allow surface ships to deploy with more anti-air and anti-ship missiles.

United States Special Operations Command, USSOCOM, is very interested in funding this. The impending inactivation of USS

JAMES K. POLK and USS KAMEHAMEHA leaves no drydeck shelter boats for SOF employment. USSOCOM has therefore agreed to help pay for the SOF delivery role of Trident SSGN.

Those that do not understand the need for submarines in today's post Cold War climate have often questioned the role of the submarine in influencing the land battle. Today, the Submarine Force must advertise its capabilities. Trident SSGN will underscore submarine relevance to those who doubt.

Acquiring new platforms and weapon systems technologies isn't an easy process. The Trident SSGN concept comes to the table with preexisting platforms, tried and true weapons, and crews that already know how to drive and shoot. The maintenance and training infrastructure is already in place.

The two submarine-producing shipyards have welcomed this concept. After USS JIMMY CARTER (SSN 23) is complete and the SSN build rate is roughly four over the next five years, Trident conversion will offer more work to help maintain our diminishing technological base. It is not surprising that certain senators and congressmen have urged the Navy to pursue Trident SSGN as a funded program.

Conclusion

A purely offensive strike platform brimming with tactical missiles and unyielding in the face of most threats is not only a tactical asset—it is a strategic asset and it will affect U.S. political intercourse. Gunboat diplomacy is alive and well, but the warfighters (i.e. Fleet CINCs) are struggling to keep it so. As Force structure continues to diminish, Trident SSGN offers a solution to many political situations that we are likely to see in the future. An agile, responsive, potent, single platform with virtually unlimited endurance and a small logistics footprint precisely meets the needs of future engagements whether they are single strikes or Major Theater War similar in intensity to Operation Desert Storm.

Most importantly, conversions must be funded within the next budget cycle, that is, before or during POM 102. With the First four Trident SSBNs scheduled for inactivation in the early part of the next decade (two in 2002 and two in 2003), the time is now. The decision to make Trident SSGN happen may be the single biggest decision the Submarine Force forces today. Converting

Tridents to a SSGN role would add more capability to the Navy and to the United States than any other commitment of equal resources.

A few hours later within the anti-ship missile envelopes of the hostile country, USS OHIO (SSGN 726) comes to PD, verifies the over-the-horizon contact picture, and launches 48 Tactical Tomahawk and NTACMS missiles. The on board Strike Party watches the attack center peri-viz as the cruise missiles and tactical ballistic missiles separate and proceed precisely to their targets. The XO, acting as Launch Area Coordinator, reports "...salvo away!" on the CINCs Ops Circuit. USS OHIO slips back down and opens datum to reposition for tomorrow's SOF insertion by twin ASDS. In-flight missile telemetry reports to the shore targeting terminal that all missiles reached their intended targets. Battle Damage Assessment will later show the destruction of 25 military installations including two chemical plants, all mobile missile sites and several deeply buried command and control nodes.

The President reports to the nation and to the U.N. that a precision strike was achieved within one of the U.N.S.C. resolution and with zero U.S. casualties. The hostile country, faced with economic sanctions and evaluating the unplanned loss of most of its power projection forces, chemical warfare centers and missile defenses, finds itself in an untenable position and renounces its hostilities.■

DUTCH OFFICERS FIND THEIR FATHERS' LOST SUBMARINES

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

In the desperate days of early December 1941, with the U.S. battle fleet crippled at Pearl Harbor and Japanese armies pouring into Southeast Asia, five Dutch submarines were ordered into action against convoys of troopships that had been sighted entering the Gulf of Siam.[1] The real Japanese objective was the oil resources of the Dutch East Indies, but first the British and Australian forces had to be cleared out of Malaya and Singapore. With the invaders starting to come ashore all along the east coast of the Malay peninsula from Singora (now Songkhla) in Thailand to Kota Bharu in northern Malaya, the British Commander-in-Chief Eastern Fleet, Admiral Sir Tom Phillips, ordered the Dutch boats to form a line across the mouth of the gulf and stay out of the way of his powerful Force Z until the big guns of the battle cruiser REPULSE and battleship PRINCE OF WALES had blasted the Japanese transports out of the water. Then starting at dawn on 11 December the submarines were to move in and mop up the remains of the invasion fleet. (See Chart 1.)

When the shocking news came on 10 December that Phillips and the core of Force Z had been wiped out by Japanese bombers and torpedo planes, the new British commander, Vice Admiral Sir Geoffrey Layton, ordered the submarines to attack immediately, even though all were not yet in their prescribed positions. The Dutch boats were organized in two divisions under the overall command of Ltz 1 (Lieutenant Commander) A.J. Bussemaker in O-16. Division I consisted of the flagship and K-XVII, relatively modern types completed between 1933 and 1936. (A third boat, K-XVIII, was undergoing overhaul.) Division II, which had been put under British operational control immediately after the Japanese attack, was made up of 1924/25 vintage K-XI, K-XII, and K-XIII. On 13 December two of the Dutch submarines drew blood.

At the northern end of the line, Bussemaker daringly took O-16 into the shallow anchorage off Patani/Singora shortly after midnight and loosed six torpedoes at the unsuspecting Japanese transports, claiming four sinkings.[2] Ltz 1 H.C.J. Coumou, in K-XII at the opposite end of line off Kota Bharu, reported hitting two more.[3] Great was the jubilation among the Allies at this evidence

of retribution against the hitherto invulnerable Japanese. However, their rejoicing was premature. More enemy transports were reported landing troops ever farther south, and on 13 December Admiral Layton ordered four of the boats to new positions off Kuantan. O-16, with only one torpedo remaining, was told to return to Singapore and enter port during daylight on 16 or 17 December. Two days later K-XII and K-XIII were similarly recalled, leaving K-XI and K-XVII on guard off Kuantan and the mouth of the Pahang River. These last two boats were ordered back on the 19th, to arrive at Singapore on 21 December. By then O-16 was already missing and gloom in the Dutch submarine force was only deepened when K-XVII also failed to report in.

Then on 22 December a bedraggled Dutch sailor was found by an Australian patrol, trudging toward Singapore in the hapless procession of native refugees fleeing the advancing Japanese. Brought to naval headquarters, Cornelis de Wolf had an incredible story to tell. A quartermaster on O-16, he had been on watch on the rainy night of 14-15 December when at about 0230 a huge explosion rent the deck forward and sent a wave of water and diesel oil over the men on the bridge. In less than a minute the boat was gone and he was gasping for breath in the lukewarm water of the South China Sea. Nearby a few other survivors called to each other and in the distance the voice of their commander was heard in reply. The swimmers clustered together, but Bussemaker failed to appear and was heard no more. De Wolf asked the only officer present, Ltz 2 C.A. Jeekel, what had happened and was told that they must have hit a mine. Knowing that Tioman Island was a few miles west of them, the men—Jeekel, de Wolf, seaman first class F.X. van Tol, seaman second class F. Kruijdenhof, and machinist A.F. Bos—decided to strike out for its shore, but van Tol and Jeekel soon succumbed to exhaustion and drowned. In the morning a Dutch aircraft passed overhead but failed to spot the swimmers, and Kruijdenhof disappeared soon afterwards. Toward evening, after 17 hours of struggling against the current that kept sweeping the men southward away from the island, Bos could go on no longer. Asking de Wolf, if he survived, to remember him to his wife and two children, he gave up and sank from sight.

Alone in the tepid sea, the sturdy quartermaster pressed on until at about noon on the 17th he was washed up on the rocky shore of uninhabited Dayang Island. Exhausted and bleeding, he fell asleep.

Waking after a few hours, he was found by a lone native in a small prau and taken to a larger island [presumably Aur] where impoverished but hospitable natives nursed him as best they could. After three days, de Wolf, clad only in shorts, rigged up a sailing prau and crossed over to the mainland, then walked for nine hours on raw feet before encountering the Australian patrol.

In the confusion as the Japanese closed in on Singapore and the British and Dutch naval units withdrew to Java and ultimately to Australia, little attention could be given to de Wolf's report. His interrogators concluded that O-16's navigators had been unable to fix the submarine's position accurately because of the rain on 14 December. Pushed off course by the unexpectedly strong current, the boat must have run afoul of one of the British minefields that the submarines had been warned were in a restricted area south of Tioman Island.

As for K-XVII, all that could be learned was that her skipper, Ltz 1 H.C. Besançon, had exchanged messages with K-XII during a brief encounter on 14 December. Thereafter there was only silence. Although Ltz 1 Coumou had later noted an oil slick and some floating pieces of teak decking, these could have come from the British warships sunk a few days earlier. Possibly K-XVII too had blundered into the same mined area that had claimed O-16, but for lack of evidence her loss was put down to an unknown cause. An official Dutch reassessment shortly after the war reaffirmed the original conclusions. There the matter stood, cases considered closed.

Cornelis de Wolf, after serving his country's submarine force for the rest of the war, retired from the navy and died in 1983, unaware that the scenario based on his remarkable escape from death at sea was flawed. Given the duration of his swim, his sightings of distant island peaks, the strength of the ocean current, and the known place where he landed, O-16 could not possibly have been far enough south to have run into the British minefield.

Later, new information surfaced from the shambles of Japanese naval records and suggested a somewhat different conclusion. By 1956 the British had found and published the information that on the night of 6-7 December the Japanese had planted a previously unknown mine line east of Tioman Island.[4] Of two auxiliary minelayers (requisitioned merchant ships) sent to do the stealthy job, one had turned back immediately after being discovered by

enemy reconnaissance planes, but TATSUMIYA MARU had laid a string of 456 lethal eggs across the route later taken by the Dutch submarines.[3] Although the Dutch naval authorities, having other problems on their minds, did not reopen the official case, the British and many students of World War II submarine operations now felt that the Dutch skippers were exonerated from the charge of having blundered into a friendly minefield. Years later, however, historians were still repeating the old assessment.[4]

Unexpectedly, the case of K-XVII was reopened in 1980 as the result of a sensational Dutch television program, on which a man with his face masked claimed to have engineered the sinking of a Dutch submarine in the Pacific Ocean on orders from Winston Churchill. The boat, he said, had discovered the Japanese fleet on its way to Hawaii, but Churchill had suppressed the information to ensure that a successful Japanese attack would force America's entry into the war. To hush up this traitorous act, the submarine and its crew had to be eliminated. This bizarre rehash of a discredited conspiracy theory was apparently perpetrated by a man calling himself Christopher Creighton, whose fantastic claims were used as the basis for a novel by Brian Garfield and later enlarged in a book by Creighton himself.[5] In the course of the TV program, the interrogator asked whether the submarine in question might have been the missing K-XVII, although the sabotage was alleged to have taken place near the Fiji Islands. This ridiculous speculation and ensuing publicity provoked Hans C. Besançon, Jr., the son of the lost boat's commander and himself a retired officer of the Royal Netherlands Navy, to undertake a crusade to find his father's resting place and disprove the grotesque fabrications of his detractors.

Although the naval authorities declined to provide financial backing for Besançon, they were able to offer some useful information. In 1981 a treasure diver from Singapore, Michael Hatcher, reported having located a sunken Dutch submarine in the South China Sea. Wrecks in the area had become well known to local fishermen who were attracted by the abundant marine life around the sunken ships, only to have their nets snagged on underwater obstructions. Pursuing this lead, Besançon contacted Hatcher and in May 1982 they moored over the wreck and sent divers down. The divers reported that the submarine had sunk deeply into the mud bottom, but they were able to recover the

steering wheel from the exposed bridge. When its serial number was checked against naval records, the boat was positively identified as K-XVII.

Yet there was still a mystery: the wreck lay well north of the reported location of the Japanese mine line. The missing pieces of the puzzle were provided nine years later by researchers in the Netherlands and Japan. Records disclosed that a Dutch flying boat had sighted TATSUMIYA MARU on 6 December and caused her to turn back prematurely. Before reversing course, however, she had laid her mines about 18 miles north of the assigned position. The remains of K-XVII lay exactly within the relocated minefield. (See Chart 2.)

Besançon's quest and its findings had attracted considerable public attention, so when a Swedish diver, Sten Sjostrand, reported finding another sunken submarine in 1995 that he suspected to be Dutch, the naval authorities were interested. Initiating a search for family members of the men lost on O-16, they organized an expedition to examine the wreck. This time Besançon was joined by his fellow retired naval officers, H.O. and A.P. Bussemaker, sons of the boat's lost commander. The Dutch group also included an official naval observer, Ltz 1 J.M. van Zee, and two journalists. The Navy also contributed funds, photographic and video equipment, charts of the area, and blueprints and identification photos of the submarine. The hulk was quickly located at a depth of 53 meters (about 175 feet) some nine miles east of K-XVII in the same Japanese mine line, draped in fish nets and with a gaping hole forward of the bridge. Details of the boat's layout confirmed it to be O-16, and the divers removed the steering wheel and some other fittings for retention as official evidence and historical mementos. The brothers Bussemaker then dropped a memorial wreath on the wreck and van Zee offered a brief prayer on behalf of the Royal Netherlands Navy. The case of the two lost submarines was finally closed.■

NOTES

1. This article is based largely on a book by Dr. P.C. van Royen et al of the Instituut voor Maritieme Historie, 's-Gravenhage: Hr. Ms. K XVII en Hr. Ms. O 16: De ondergang van twee Nederlandse onderzeeboten in de Zuid-Chinese Zee (1941).

Amsterdam, Van Soeren & Co., 1997. I am indebted to Dr. Christina Bertrand for translating relevant sections from the Dutch.

2. Japanese records confirm that O-16 sank three ships in shallow water at Patani: TOSAN MARU (8,666T), KINKA [or KIN-KASAN] MARU (9,306T), and ASOSAN MARU (8,811T). All were salvaged and sunk again later in the war. Dutch sources have also claimed SAKURA MARU (7,170T) and AYATA [or AYATOSAN] MARU (9,788T) for O-16, but Japanese sources say these ships were only damaged by aircraft at Kota Bharu. Japanese and Allied records for that period are extremely sketchy and often inconsistent, leaving some doubt as to the actual events.
3. K-XII is credited with sinking TORO MARU (1,939T) although some sources assign that ship to O-16. The British claim that TAIZAN [or TAISAN] MARU (3,525T) was also sunk at Kota Bharu by K-XII (one writer credits K-XIII), but Japanese records fail to confirm any damage there.
4. Naval Staff History Second World War, Submarines, Vol. 3, Operations in Far Eastern Waters. London: Historical Section, Admiralty, 1956.
5. Van Royen identifies the second minelayer as the CHOSE MARU, but that ship is not listed in Warships of the Imperial Japanese Navy, 1869-1945 by Jentschura, Jung, & Mickel, a standard reference.
6. Dull, Paul S. A Battle History of the Imperial Japanese Navy (1941-1945). Annapolis, MD: Naval Institute Press, 1978 (third printing 1982).
7. Garfield, Brian in collaboration with "Christopher Creighton." The Paladin: A novel based on fact. New York: Simon & Schuster, ca 1980. Van Royen identifies the other book as: Creighton, Christopher. Operatie JB: Het laaste grote geheim van WOII. London/Amsterdam, 1996.

Chart 1. Submarine positions 14-15 December, 1941.

Chart 2. Reconstruction of the sinking of O-16 and K-XVII.

CONVOY: THE FORGOTTEN YEARS 1919-1939
Part I

by John Merrill

Earlier Convoys

Convoying merchant ships at sea to protect them from marauders has been an almost intuitive naval tactic possibly since the Phoenicians. In 1673, Samuel Pepys, then Secretary of the Admiralty Office, instituted a convoy system to protect British trade from damage by Dutch privateers. Convoying was certainly successfully achieved during the age of fighting sail in the 16th, 17th, and 18th centuries against the surface raiders called cruisers. The British Convoy acts of 1793 and 1798 declared it illegal for Britain's overseas commerce to proceed unescorted in wartime in the age of sail. There was a three hundred-year custom of convoys in Holland, France and Great Britain.

Regarding Convoy

Examination of acoustic detection of enemy submarines during both World War I and II brings one's attention to convoying merchant ships. With a long and successful historical record of navies directly protecting merchant ships, it might be assumed that this tactic would be quickly invoked in a twentieth century war. Yet during the first several years of World War I, there were English military and civilian leaders and other members of the Allies who, in the face of available evidence favorable to convoying merchant ships, dissented regarding the need and the advantages to be gained by its implementation. Although begrudgingly, merchant ship convoying was implemented by the Allies May 1917 and was hugely successful for the remainder of the war.

After the armistice, November 1918, following the quick success of convoying during the last one and one half years of World War I, the tactic and consideration of its planning or readiness seem to have been put aside or forgotten. Further, as naval historian Captain S. W. Roskill, RN noted "...not one exercise in the protection of a slow moving mercantile convoy against submarines took place between 1919 and 1939." The negative attitude toward merchant ship protection at the beginning of World War II still persisted in some quarters.

Submarine Century Begins

A century of submarines began in April 1900 when the newly formed Electric Boat Company and one of its subsidiaries, the John P. Holland Torpedo Boat Company, sold the submarine HOLLAND VI to the United States Navy. This was a landmark event, establishing the submarine on the international scene. The successful submarine and Holland's patents for their construction provided the basis for an extraordinary interest in submarines and submarine building by most of the world's leading countries. By the eve of World War I fourteen years later, there were 400 submarines in sixteen navies armed with torpedoes, deck guns, and mines.

By 1900, worldwide naval thinking was strongly influenced by the writings of Alfred Thayer Mahan, an Annapolis graduate, long-time career officer, and teacher at the U.S. Naval War College whose books on naval strategy were accepted by the naval elite in all the maritime powers. Mahan's teachings were focused on single, decisive, offensive naval engagements with enemy battleships. The concept of a clash of the modern armadas came in part from his widely read and accepted conclusions in The Influence of Sea Power upon History: 1660-1783 (1890) and The Influence of Sea Power upon the French Revolution and Empire, 1793-1812 (1892). The unprecedented technological changes in ships and armament made the scene in World War I vastly different from the world of sail so well understood by Mahan. Acceptance of the submarine as more than a coastal defense craft and an appreciation of its potential as an offensive naval craft would require new generations of naval officers in the post-Mahan era.

On April 20, 1904, Admiral Sir John Fisher, First Sea Lord and creator of Britain's dreadnought fleet, made a most prescient comment relative to submarines when he said "In all seriousness, I don't think it is even faintly realized...the immense impending revolution which the submarine will effect as offensive weapons of war."

The same year, extensive at sea exercises were held off Portsmouth, England in Spithead strait. Six recently completed British submarines of the Holland design, now equipped with a periscope, were part of the operation. It quickly became apparent that capital ships involved would require extensive destroyer

screening to protect them from the submarines. Alarm over the submarine's effectiveness was heightened by the fact that there was no method for detecting a submerged submarine (even though when totally submerged they were vulnerable to mines). No further consideration was given to antisubmarine defense until the War. The submarines fared well in the exercise.

Later, on the brink of World War I in 1913, Fisher wrote a memorandum, "The Submarine and Commerce," and noted "...if the submarine is used at all against commerce, she must sink her capture." Among the higher echelons including Winston Churchill then First Lord of the Admiralty, First Sea Lord Prince Louis of Battenberg and Commodore of Submarines Roger Keyes, there was opposition and lack of acceptance of Fisher's view about submarines sinking their foes. Fisher was somewhat alone in his views at the time but the early conduct of the U-boat commanders in the opening months of World War I supported Fisher's observation.

A well-turned comment regarding submarines at this time appeared in a history of oceanography written by Susan Schlee. At the onset of World War I, that United States, France, and Britain seemed to have taken the advice offered a Prime Minister by a First Lord of the Admiralty in 1804, on the occasion of seeing Robert Fulton's plans for a submarine: "Don't look at it, and don't touch it. If we take it up other nations will, and it will be the greatest blow at our supremacy on the sea that can be imagined."[1]

In spite of historical evidence favorable to convoying, the Allies in World War I waited nearly three years until April 1917 to invoke convoy as a way to effectively curb the very successful U-boats sinking of merchant ships. Earlier in February, there were 140 U-boats involved in unrestricted warfare. The effect of German submarines sinking one of every four merchant ships leaving England was catastrophic. In addition to the extreme death toll, the loss of many ships and their cargoes produced a number of severe shortages. By April, England's heavily-imported food supply was down to sixty days and in June, oil essential to both military and industrial needs was down to a three month supply. During the twenty-one years between the two World Wars, the

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1. S. Schlee, "The Edge of an Unfamiliar World: A History of Oceanography", Dutton, NewYork, 1973, p. 245.

submarine improved in every respect along with its weapons and in numbers. Fully adequate resources for broad implementation of merchant ship convoying were not immediately available in Great Britain at the start of World War II. Although full United States participation in the new war was delayed for more than two years, ample resources for merchant ship convoying would be in short supply until 1943.

Slowness to respond to the U-boat havoc at the start of World War I may possibly be laid to the low regard in which the gradually-developing and evolving submarine was held. An item in print in 1902 referred to the submarine as not an honest weapon. Other comments were also demeaning. The underwater craft, small and lacking even some of the elementary needs for adequate crew habitability, was held in derision by some. To others, the submarine was identified with coastal defense and the recourse of a nation with a second rate navy. Navy culture envisioned itself as an aggressive force, not a defensive one; and submarines were not viewed as vital in the offensive concept yet by some, the submarine was seen as a craft that could undermine navies.

In *Some Principles of Maritime Strategy* (1911), Sir Julian S. Corbett observed that commerce raiding was not likely to be strategically decisive so convoys would be unnecessary. He appreciated the role that submarines would play against capital ships. However, he did not grasp the extent to which submarines would become the cruisers of the future.

Flawed perception of the then narrowly-practical submarine a little more than a decade on the international naval scene revealed its strongest feature when German U-boats adopted the *guerre de course* approach to offensive action. This found the Allies totally surprised and unprepared with regard to countering the U-boat's success. In 1915, when Germany was the first to launch unrestricted submarine warfare, even those naval officers versed in submarine warfare as it was understood at that time were disconcerted.

Previously, it was understood that submarine warfare would be restrained by maritime law and the unacceptable ethics involved in submarine sinkings. In some instances, either using gunfire or placing an explosive charge would finish off the merchant ship under attack by an enemy submarine. This provided an assured sinking. International law at the start of the war required verifica-

tion of cargo by an enemy submarine prior to combat engagement. Litigation regarding some World War I U-boat sinkings of merchant ships continued into the 1920s.

U-boat accomplishments and the beginnings of antisubmarine warfare (ASW) were concurrent. The concept of submarine against submarine had its origin in the search for ways to counter the U-boats in the desperate times of World War I. The remainder of the 20th century witnessed the unending development of ASW—always off balance as submarines gained acceptance and were provided with improved operational abilities and better weapons. A further obstacle to success against enemy submarines is the ocean, the submarine's operating medium. It is not transparent.

World War I
England—German Submarines—Convoy

Within six weeks of England's declaration of war against Germany August 4, 1914, Germany's U-boats torpedoed four English cruisers with a loss of more than 1600 lives. By the end of 1914, U-boats successfully moved on merchant ships and asserted rights as their own referees at the scene of the encounter. In addition to the sinkings of merchant ships, the number of ships damaged became excessive and created additional burdens on the already overworked British shipyards. Germany began its first unrestricted U-boat warfare between February and April 1915. Before the first year of the war was over U-boat sinkings outweighed ship losses to any other weapon. The true nature of submarine warfare was emerging. Tactics and weapons for antisubmarine warfare were not immediately at hand.

Convoying military troopships was invoked immediately. Two weeks after the start of the war, the British Expeditionary Force including men, equipment and stores safely negotiated the crossing to France with the aid of convoying. Hundreds of thousands of Allied troops were successfully transported using convoys between India, Egypt, England, and France. In October, a Canadian contingent of soldiers and equipment in a convoy of more than thirty ships transited unharmed to England. Convoys had not been forgotten. Merchant ships with civilian passengers, crews, and cargoes were not in the purview of the Admiralty's consideration as candidates for the advantages of convoy. There were occasional

exceptions to this approach to convoying.

Arguments against merchant ship convoying focused on several concepts, which were ultimately proved not correct. The large number of merchant ships now needing protection was an additional consideration. In earlier times when convoy had been invoked, the number of merchant ships was considerably smaller. There was misunderstanding regarding the number of escort ships required per convoy. Later, the ratio of escorts per merchant ships proved to be a much smaller number than that originally thought by the Admiralty. The skills of the merchant marine ship captains and crews to participate in convoying were also underrated during these early deliberations. Delays in shipping due to organizing convoys were an additional point of argument.

The tools available for countering the U-boats in the beginning of the war were limited. Visual U-boat sighting was the chief method and confined to daylight. Mines and gunfire were the weapons. Sweeping vast areas of the ocean visually with limited numbers of search vessels to locate a single 200-foot long U-boat, which might or might not be located on the surface, was typical. Earlier, Mahan succinctly addressed the issue by claiming "the results of the convoy system warrants the inference that, when properly systematized and applied, it will have more success than hunting for individual marauders—a process which, even when most thoroughly planned, still resembles looking for a needle in a haystack." Proponents of this Mahanian view were scarce.

As the war progressed, improved mines, depth charges, and the beginnings of elementary acoustic underwater detection equipment appeared toward the end of the conflict. Radio communications for the searchers were still in a basic stage of development. Blimps, planes, and submarines were used in convoy and antisubmarine efforts before the war ended.

Convoy Deadlock

The British Navy, even with the accumulated evidence of U-boat prowess in the fall of 1916, was reluctant to invoke convoy for merchant shipping. The advantages and potential of the concept of convoy and its subtle ramifications were not understood. The Admiralty's dilemma in dealing with the U-boat problem and general acceptance of the submarine as a part of modern navies

may be viewed by considering the following: the submarine was still a relatively new development and its stealth properties made it unique; the U-boat success as a commerce raider was not expected; and further, as mentioned previously, equipment for combating submarines was not at hand. It was an unconventional weapon intruding on a centuries-old conventional navy. Similar attitudes towards the submarine were held in the United States Navy.

Even in the face of the sinkings the preceding year January 1917 found the Admiralty publishing an official view declining convoy as a requirement for safe passage. John Winton wrote in *CONVOY: The Defence of Sea Trade 1890-1990* (1983) "the pamphlet which stated, quite definitely and emphatically, that convoy was not a sound method of defending trade." Another severe blow to the already jeopardized merchant vessels came in the German announcement 31 January that unrestricted submarine warfare would begin the next day. With forty-six U-boats at sea, extreme losses would occur in the following six months.

The crisis could no longer be ignored. Commitment of scarce resources for convoy escort did not occur until after several more months of negotiation, haggling, and with encouragement from the United States. Rear Admiral William S. Sims, USN, assigned to London to cooperate and keep the United States Navy Department apprised of the British scene, arrived on 9 April 1917. Sims secret departure for England was just prior to America's entry into the War. Secretary of the Navy, Josephus Daniels, briefed Sims regarding the Wilson administration's views on the British navy's performance in the War. Two points were that the British had not been vigorous enough in their efforts to curb the U-boat destruction of shipping and that all ships ought to be convoyed. The convoy dilemma heightened when on the night of April 17 thirty-four ships were sunk.

Shortly after his arrival three days after the American declaration of war, Sims promptly encouraged a study to be undertaken regarding the practical aspects of convoying. The study was quickly completed and acknowledged the practicability of convoying. Sims, a senior and experienced officer, by his maturing pro-convoy stance helped to expedite the resolution by the Admiralty to undertake convoy to counter the U-boats' decimation of the merchant shipping. His position stated "...It therefore seems to go

without question that the only course or action for us to pursue is to revert to the ancient practice of convoy. This can be purely an offensive action, because if we concentrate our shipping into convoy and protect it with our naval forces we will thereby force the enemy, in order to carry out his mission, to encounter naval forces...we will have adopted the essential principle of concentration." An enhanced program of merchant ship convoying was undertaken within the month.

David Lloyd George, with only a few weeks in office as Prime Minister, was finally able to prod the reluctant Admiralty to adopt convoying as a last resort to stem the huge merchant ship losses to the U-boats. The end of April saw the initial steps by the Admiralty to convoy all vessels (except those above fifteen knots) British, Allied, and neutral. An April 30 convoy from Gibraltar to the British Isles was a success. Transatlantic convoys would be next. Requests for U.S. Navy escort participation were initially greeted with the same reluctance and arguments that the Admiralty had been using. A particular point was the ratio of escorts to the number of merchant ships but eventually this was no longer an issue.

The destroyer with its high speed and torpedoes proved to be the convoy escort's cornerstone. Sloops, trawlers, old cruisers and old battleships were included in the merchant ship escorts. It was quickly learned that convoys of as many as twenty or thirty merchant ships could be successfully managed. Equipping convoyed merchant ships with arms enhanced safe transits. In the three-month period of May through July 1917, the total losses in convoy and independent losses through U-boat attack in the Atlantic and British Home Waters after the introduction of convoy was 383 ships sunk. Of 8707 ships convoyed, 27 were lost. Independent losses comprised the remainder.

By the following year, 1918, the shipping losses fell by two thirds. Antisubmarine Warfare (ASW) involving Allied resources from Britain, Italy, U.S., and Japan included 400 surface vessels, 216 seaplanes, 85 large flying boats, and 75 blimps. On a manpower basis, it has been estimated that 100 men from the Allies were needed for each German on a submarine. Another evaluation concluded that 25 allied warships and 100 aircraft per U-boat was needed.

The submarine changed the way war at sea was conducted.

Enemy submarines complicated the means and character of naval warfare in different ways. The demand for naval resources to prosecute ASW and convoy escort obligations was extreme. Sometimes this led to force dispersion. Convoying was successful in saving ships and lives. In addition to the vast amount of resources, manpower, and platforms, additional time was required to organize the convoys. The speed of transit was slower to accommodate the merchant ships. Calculations indicated a 25 percent loss in carrying capability when convoy is in use. By the end of the War in late 1918, England had between 400 and 500 destroyers in commission to meet the critical needs for convoys and patrols. The U-boats did not control the seas, they denied access. Safe passage came at a price.

As the war ended, ASW patrolling and convoying were being brought to bear. The resources included ships, submarines, airplanes, and blimps. The weapons were mines, depth charges, steel nets, and torpedoes. By 1918, acoustic detection of submarines was in the embryo stage and slowly evolving. Also, it would seem that U-boats and the success of *guerre de course* would have been indelibly imprinted on future naval thinking and planning. Convoying prevented the Allies from losing the war in 1917. The leading maritime nations of the world would give their attention at varying levels to ASW for the remainder of the century.

As World War II began, the repeated success of the U-boats and availability of the means to counter them was again limited. The reasons for this are not totally clear. Preparedness, support and awareness of convoying merchant shipping were lacking. United States implementation of the convoy tactic in the latter part of the War for merchant ship protection from the again successful U-boats in 1941-42 was not swift. Consideration of the period between the close of World War I and the beginning of World War II may provide some insight.■

Editor's Note: Part II will appear in the April 1999 issue of THE SUBMARINE REVIEW.

U.S. Navy

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Waldo Lyon and the Development of the Arctic Submarine

BY WILLIAM M. LEARY
FOREWORD BY JOHN H. NICHOLSON

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THE ORIGIN OF ALBACORE

by Richard P. Largess

Editor's Note: This article is taken from a forthcoming book by Mr. Largess and Mr. Mandelblatt, both members of The Naval Submarine League.

On December 15, 1953, Rear Admiral Charles B. Momsen spoke at the commissioning of ALBACORE. This speech summarized the basic characteristics and purpose of ALBACORE, and confidently predicted future submarine speeds of better than 50 knots. This last remark was quoted by foreign naval analysts for the next four decades and obviously rocked the Soviet Navy, which made vast efforts to achieve such unbelievable results.

Admiral Momsen also stated: "Back in 1948, when I held the position of Assistant Chief of Naval Operations for Undersea Warfare, I conceived the idea of designing and building this submarine... In 1948, I held a meeting in BuShips and asked the design people how they would like to be given a free hand in making a hydrodynamic study of a submarine from the standpoint of submerged performance only.....Since it would have no ordnance, only the Bureau of Ships would be involved. We wanted to use conventional power plants so it could not be called experimental. But since we wanted high speed, the designers would incorporate in it all of the features of designs which would make a submarine go faster when submerged."

Admiral Momsen was a man of iron personal courage, a brilliant engineer and inventor, and a superlative leader and administrator. His list of achievements is great: early experiments with submarine-carried aircraft, the invention of the Momsen Lung submarine escape apparatus, and the McCann rescue chamber, or diving bell, as well as the use of helium in diving to prevent the *bends*. He supervised the use of the McCann chamber to rescue survivors of SQUALUS, which went down on May 23, 1939, during sea trials out of Portsmouth, and supervised the testing off Hawaii in 1943 which discovered a crucial flaw in the design of the American torpedoes.

He commanded the first American *wolfpack* and the battleship SOUTH DAKOTA during World War II. His appointment as the

first ACNO for Undersea Warfare in June of 1948 was truly a *defining moment* for the U.S. Submarine Service, ending the period of doubt and demoralization following their "silent victory" and the end of the opponent it had been created to defeat—the powerful Japanese surface navy. Plainly Admiral Momsen had thought in terms of submarines with ALBACORE-like capabilities for many years and he played a key role in pursuing and obtaining the authorization for 569.

But was he the first to conceive ALBACORE? Or its most important proponent? Captain Frank Andrews, the submarine project officer at the David Taylor Model Basin in 1953 to 1954, states that the concept of a submarine designed for maximum submerged performance—including the *body of revolution* hull, single screw, and the use of HY-80 steel—was first proposed by the Committee on Undersea Warfare (CUW) of the National Academy of Sciences (NAS) in 1948. The NAS, the equivalent of Britain's Royal Academy, was founded in 1863 to provide the Federal government with expert scientific advice from the nation's scientific community. The first problem it was called on to solve was compensating for the error caused in magnetic compasses by the iron hulls of the Navy's new warships. Over the years the NAS created a huge number of committees to deal with specific problems, from insect control in Micronesia to navigation and astronomy for the Navy. The CUW, however, was initiated directly by the scientists themselves.

World War II anti-submarine warfare, depending on the creation of artificial electronic senses, radar and sonar, to penetrate the submarine's cloak of invisibility, required a huge and innovative research effort, also producing the magnetic anomaly detector (MAD), sonobuoys, the homing torpedo, and operations research analysis. In 1943, when it seemed the U-boat threat had peaked, the effort was switched to support U.S. submarines, providing them with new sensors, weapons, and materiel. But in 1945 with the discovery of German advanced submarine technology, it was apparent that the problems of undersea warfare in the future were far from solved.

Leading scientists, including Dr. Gaylord Harnwell of the University of California and Dr. Detlev Bronk of Cornell, chairman of the NAS National Research Council, sought to continue the close partnership of the scientific community and the

U.S. Navy, developed during the war, through a formal liaison body. (As Dr. Harnwell said, "We spent four or five years learning to get along with the Navy—let's not let that disappear.") The CUW was established on October 23, 1946. John Tate of the National Defense Research Council became first chairman, Harnwell Vice-chair, and John S. Coleman of Penn State executive secretary. On July 20, 1948, the Chief of Naval Research requested that CUW create a panel to investigate the hydrodynamics of submerged bodies. On November 7, 1949, the Committee submitted its "Interim Report of the Panel on the Hydrodynamics of Submerged Bodies". This 64 page report examined the scientific principles governing submarine performance and strongly suggested the Navy design and build a high speed research submarine capable of exceeding 20 knots submerged. The report was placed on Admiral Momsen's desk on January 10, 1950 and it played a key role in securing authorization for ALBACORE. Plainly however, the idea had been growing for several years already in the CUW, in BuShips, in the submarine community, and at David Taylor, gradually taking on a more concrete and detailed form.

In his book U.S. Submarines Since 1945, author Norman Friedman notes that BuShip's "High Speed Submarine Program" began in the Spring of 1946. He writes that BuShips officially requested on July 8, 1946 that DTMB undertake the *Series 58* tests, which went on to produce ALBACORE's hull form. (The tests began in July 1949.) BuShips had a hand in the development of ALBACORE from the beginning: some of its key contributors included naval architect John C. Miedermair, *father of the LST*; Vice Admiral Edward L. Cochrane, Chief of BuShips and later Dean of Engineering at MIT; and Rear Admiral Andrew L. McKee, also a member of the CUW Panel on Hydrodynamics. McKee was the designer of the fleet submarine and later served as design director at the Electric Boat Company in Groton, Connecticut, responsible for the design work on most new submarine construction until 1961. Dr. Gary Weir quotes a colleague at EB, Henry J. Nardone: "He was one of the last of the breed of engineering duty officers who could sit down and design a submarine almost from scratch."

Mmany people saw ALBACORE as an idea whose time had come and were determined to make it a reality. Also, there were many who did not; in a Defense Department dominated by the Air

Force and concepts of strategic bombing, in a Navy dominated by carrier air, and in a submarine service formed by the experience of World War II—hunting Japanese shipping in wolfpacks on the surface at night, in fleet boats with powerful gun armaments and high surface speed. As John Coleman, first executive secretary of the CUW and a leading figure in wartime sonar research, put it: "We encountered much inertia, some hostility...the CUW was ignored above a certain level." But "ALBACORE was built because enough good men decided it should be built."

Thus the roles of these key individuals and institutions are overlapping. Perhaps the simplest approach is to look at the contribution of each institution separately, remembering that what is happening is being done by a small group of people working closely together. But—one last time—was anybody first to propose the ALBACORE?

When the question was put to John Coleman and George Wood, first and third executive secretaries of the CUW respectively, 45 years later, both men looked at each other and laughed. George Wood said, "The Navy built ALBACORE to get Ken Davidson off its back."

Gary Weir quotes Davidson's July 26, 1946 letter to Captain Harry Saunders at DTMB urging the ALBACORE idea. He called for the production of a completely new approach to submarine design—"a rational design" instead of "ceaseless modification and juggling" of existing designs, yielding "a second rate answer." But according to Coleman and Wood even earlier "back in the beginning" Davidson had approached Admiral Cochrane to work out a strategy to get her built. "The Navy wouldn't do basic research on hydrodynamics; David Taylor wasn't interested."

Dr. Kenneth S.M. Davidson was professor of Engineering at the Stevens Institute of Technology in Hoboken, New Jersey, as well as Director of Stevens' Experimental Towing Tank (now known as Davidson Laboratories). Dr. Davidson was also chairman and vocal spokesman for the CUW's Hydrodynamics Panel, chairman of committees on Towing Tanks and Hydrodynamics for the Society of Naval Architects and Marine Engineers, and later Science Advisor to NATO. According to Dan Sawitsky, Professor Emeritus at Stevens, Davidson began his career as a mechanical engineer. Before 1931, Stevens had no ship research facilities but Davidson was an avid sailor who crewed in many yacht races. He

became so enthralled with the question of why some yachts always won that he began his own research, towing models with a simple dynamometer in the Stevens 60 foot pool at night, after the pool closed. His results brought a smashing victory to the RANGER in the 1937 America's Cup race. Meanwhile, he got Stevens to build a towing tank in 1935. In World War II, he worked on the hydrodynamics of seaplanes, PT boats, and torpedoes, and a complex study of the maneuvering capability of many types of ships. It was the study of torpedoes which convinced him that submarines should be similar streamlined bodies. Dr. Sawitsky says: "He (Davidson) approached the Navy's Experimental Model Basin [predecessor to DTMB near Washington]—they weren't interested. He spoke to a number of officers—couldn't break through—then one said to go ahead, do model tests. The data confirmed what Ken had been saying. When things started going well, the Navy opened up its facilities and we kept on working. The genesis of ALBACORE is Stevens, with Ken Davidson's leadership and his team."

Coleman and Wood concurred. "Stevens Institute played more of a role than anybody knows." Did Davidson work out the final hull form for ALBACORE? "Ken may have—but in any case, he watched it like a hawk," Coleman and Wood stated.

On the other hand, John C. Niedermair of BuShips, who has been described as being primarily responsible for the basic design of almost all naval ships at that time, said: "Ken Davidson suggested the streamlined hull form to me and to others just as though we'd never thought of it...one thing he did anyway, he got the top guys to listen to us about it, he did that all right... I went up to Electric Boat Co.... saw a model of PLUNGER [an 1897 design by John Holland]. I asked if I could have it to show the streamlined sub wasn't anything new."

When the Interim Report appeared, it was voluminous, filled with data, equations, and graphs. But one thing made perfectly clear was that there was no mystery about the potential of streamlining for vastly decreased resistance and increased speed. Drag is essentially based on two things: eddy turbulence caused by the interruptions of flow lines of water around the body, and skin friction. The rounded bow and tapered stern of ALBACORE (as well as the elimination of all projections except the sail and control surfaces) greatly reduced resistance from eddy turbulence. Surface

friction was reduced by keeping surface area to a minimum, hence 569's short, fat shape, a teardrop with no parallel midsection and a low length to beam ration.

Early on, Ken Davidson realized that while almost no work had been done on the hydrodynamics of submerged submarines, much had been done in the field of **aerodynamics**. Air and water differ in density, but the principles of fluid dynamics remain the same for both mediums. (Indeed, the report speaks of the "Lyon-form submarine", with a length-to-beam ration of only 5 to 1. The "Lyon-form" apparently refers back to the work of British scientist Hilda Lyon, who reportedly worked out the ideal streamlined hull form for the British dirigible R-101 of 1929. This hull form served as the starting point for the ALBACORE researchers.)

The real problem, however, was "the far-reaching consequences of increases in speed", with their profound and little understood effects on stability, control, and handling. **Controlling** a submarine moving at the speeds made possible by streamlining and revolutionary new power sources was the problem. And the single concluding recommendation of the report was that the Navy build a test submarine to solve it.

Obviously, proving something on paper does not ensure that it will be done. John Coleman speaks of his own efforts to convince the Navy to build a test submarine, beginning two years before the Interim Report was issued, efforts which were strongly supported by Admiral Cochrane and Admiral Charles W. Styer.

Admiral Styer, who had been Admiral Momsen's predecessor, had served as a submarine squadron commander during the war, then as ComSubLant (Commander, Submarines Atlantic Fleet), and then as Coordinator for Undersea Warfare. He was the Assistant to the CNO for Operations, with no staff or organization for submarines. Carrier air dominated the Navy command; CNOs Nimitz and Denfield had refused to create a Deputy CNO for Submarines. Styer and Coleman frequently encountered the argument that the *Gupplies* were already "98.6 percent submarines and any improvement would just add a fraction of the remaining 1.4 percent."

John Coleman attributes much of the *development strategy* for ALBACORE to Admiral Cochrane. Cochrane was deeply respected; a distinguished naval architect and scientist (and "a hell of a nice guy—very forceful"), he served the purpose of "verifying

the concept. If he said it could be done, then it could." Equally important, Cochrane foresaw that to genuinely convince the Navy of the value of ALBACORE's achievements, it had to be a *ship of the line*, a full size Navy-manned submarine built by BuShips, not by the Office of Naval Research. Funding for the submarine had to come from the regular shipbuilding appropriations, not from research funds. If ALBACORE was built as a small test vehicle, manned by civilian technicians, she might have been able to prove the theory perfectly, but unless she went head-to-head against the fleet, a submarine dramatically out-performing all other real submarines, would the Navy really appreciate ALBACORE's revolutionary but highly practical significance? The concept of using ALBACORE as a high speed target vessel for ASW training was also a useful argument in getting her built as a full sized submarine. Her completion without armament was the other side of the coin; this would ensure that she remained available for research, not taken away for operational missions requiring features that could spoil ALBACORE's hydrodynamic perfection. Indeed, in April 1950, Captain Armand Morgan of BuShips headed off a request from BuOrd (Bureau of Ordnance) to add a torpedo tube to ALBACORE by pointing out that by adding the tube, ALBACORE's length would have been increased to such an extent that her underwater speed would have been reduced to that of the Tang class submarines.

As John Coleman says, his own task and that of the CUW was largely one of taking political initiatives within the Navy, convincing it of the vital submarine warfare challenges the service faced—and of the solutions. "The CUW were all unpaid volunteers acting in an association of trust; admirals talked to them as equals, knowing that the CUW members represented people whose help had been vital to winning the war. The Committee's job—at a time when there was no real submarine community to speak of—was to scout around, see what the real needs and ideas were, and organize things to do it. The Committee was a driving force."

The creation of an ACNO for undersea warfare, OP-31, in June of 1948 ended this state of affairs. Admiral Forrest Sherman, CNO in 1949, restored ASW and submarine warfare to prominence. The minutes of the Submarine Officers' Conference (SOC), created in 1925 to provide Washington with the views of submariners themselves, now began to show a proliferation of new ideas,

designs, and prototypes being discussed. These included the nuclear boat, other air independent propulsion systems including hydrogen peroxide, the so-called "high speed submarine", which became TANG, radar pickets, a submarine oiler, a submarine mine layer, a 25 ton midget submarine, a 250 ton boat to test the threat of the numerous Soviet Malyutka class coastal submarines, and—ALBACORE.

The first mention of "the high speed submarine hull" appeared on March 11, 1949. And on May 18, "There is an immediate requirement for a high speed submarine (at least 25 knots...) as an anti-submarine warfare target. The committee recommends that the above be submitted as an operation requirement." Captain Dan Daspit discussed this "high speed training submarine...with no military characteristics...which you heard about before...primarily for submerged operation. It is not a surface ship designed to dive." On August 15 of that year, Daspit also told the SOC of Dr. Harnwell's proposal for an unarmed, scientific "research fleet".

On January 10, 1950, the Interim Report reached Admiral Momsen's desk and on January 24, SOC minutes refer to the "SST experimental hull for studying stability and control at high submerged speeds." And on April 3, 1950, the minutes also add "...it is to be constructed under a 1950 supplementary shipbuilding program, if...approved by Congress."

Meanwhile, at DTMB, several years of work by Dr. Louis Landweber and the Hydrodynamics Division were nearing completion. Landweber had been hired on as a physicist at the old Experimental Towing Basin by Captain Harry Saunders, to upgrade the scientific level of ETB's work. His team of scientists—including Georg Weinblum, Phil Eisenberg, Marshall Tulin, and Bill Cummins—made seminal advances in the understanding of frictional resistance, surface wave effects, dynamic stability, viscous resistance, computer modeling, and many other areas. Hartley Pond solved the problem of downward force created by the flat decks of the Guppy class boats. In July of 1949, Landweber and Morton Gertler began the Series 58 program, testing 24 lathe-turned wooden 9 foot models of varying length-to-beam ratios and nose and tail shapes, starting with a form based on the R-101 and H.B. Freeman's study of the Navy's 1931 airship AKRON. The Series 58 tests were divided into four phases, as determined by alterations to the stern control surfaces, including *X* and cruciform

stern planes, in combination with single or twin screws. The results were published in April 1950 as "Resistance Experiments on a Systemic Series of Streamlined Bodies of Revolution for Application in High-Speed Submarines", by Morton Gertler. The results of these tests showed that a smoothly tapered hull with a length-to-beam ratio of 6.8 and a single screw as found to be ideal.

Later, the National Advisory Committee on Aeronautics (NACA, the forerunner of NASA) and the California Institute of Technology developed free-running models of ALBACORE to test computer predictions of the hull's behavior. A 30 foot model was tested at NACA's wind tunnel at Langley Air Force Base in Virginia to investigate attachment and filleting of its sail and fins. According to Captain Harry Jackson, this was done to generate higher Reynolds numbers since they could not get the models up to high enough actual speeds in the limited length of the DTMB towing tanks.

Meanwhile, on March 2, Captain F.X. Forest reviewed progress at DTMB following a visit by Admiral Momsen. Forest noted: "There has been some tendency to consider the submarine [SST] as an underwater airplane. This analogy is good but...limited...principally because the airplane is not limited to vertical movements within three of its own lengths." Also, "surface effect forces would be 5 or 6 times those of Guppies, making near surface operation a problem." The new submarine can be driven at 27 knots with less than 10,000 horsepower, and "it is clear that it would be totally impossible to drive the Guppy at 27 knots with any such power." Also:

"Perhaps the most pressing and different problem in the entire program is the study of control and response...the submarine in a dive has little or no margin...in a dive at 27 knots, the controls must start the pull-out almost as soon as the submarine has entered her dive." The merits of directionally stable versus unstable submarines was also discussed. The former had the advantage of being more easily controlled in level flight and in maneuvers at depth it will not overshoot..."

On May 5, a conference on "Submarine Maneuvering" (attended by Ned Beach, Dr. Landweber, and John Niedermair) discussed the SST's role in developing high speed tactics for evasion and attack. They also noted the potential danger of a casualty to the bow or stern planes—jamming in position, something impossible totally

prevent—which could send the submarine below her collapse depth. Incorporation of fail-safe hydraulic circuits was suggested.

Meanwhile: on March 10, 1950, Secretary of Defense Louis Johnson approved the Secretary of the Navy's request to construct the SST in fiscal year 1951, as a substitution for one of the DDE (escort destroyer) conversions in the 1950 budget. On March 27, the Ship's Characteristics Board (SCB) submitted its "First Preliminary Characteristics for Shipbuilding Project No. 56, proposed for the 1952 increment."

Several issues surfaced over the SST's characteristics. On September 26, 1950, Captain Armand Morgan told the SOC that two SST designs had been prepared for use, an "austerity model" and a "target model". The secondary ASW target role envisioned was starting to cause some problems and misgivings. For the SST to be able to survive the impacts of inert Mark 35 torpedoes, the submarine needed a double hull, even though a single hull would have given her ½ knot more. A snorkel would also have been valuable with her use as an impact target, although this would have increased considerably the size of the sail, already a major source of drag.

From ALBACORE's original size of 150 feet long and a beam of 30 feet, with a crew of 4 officers and 36 men, she was enlarged to 200 feet length, 27 foot beam, 1,692 tons surface displacement, with a complement of 5 officers and 52 men, along with 7 scientists. This increase resulted in some loss of speed. Besides the double hull and other requirements needed for the target role, Captain Harry Jackson says that it was originally intended to operate the submarine from Portsmouth, returning to port daily with a very small crew. It was realized that the nearest waters deep enough for submerged testing, the Wilkinson Deep, were far enough from PNS to require operations on the basis of weekly cruises and thus enlarged berthing and galley spaces.

BuShips began to have severe misgivings about the impact target role, pointing out the danger of a hit on the submarine's control surfaces, causing a loss of control which could send the submarine below her collapse depth. BuShips pointed out that the SST's value as a hydrodynamic test vehicle and as a "non-impact" ASW target for sonar tracking were considerably more important; these roles should not be compromised. They strongly argued against a snorkel, suggesting economical provisions for this and

other "impact target" features at a later date. (This would most likely still have compromised the submarine's design and was probably not done.)

On November 29, 1950, the SCB noted that "the Committee on Undersea Warfare of the NAS strongly advocates the construction of this ship." The recommendation was then made that "the Experimental and Target Submarine...tentatively designated 'SST'...be classified as 'AG(SS)' and assigned the name 'T-1'."

On December 6, 1950, a memorandum from the Assistant CNO for Undersea Warfare agreed that the test submarine be classified as an auxiliary type. "It is felt, however, that the unique features of the ship should be identified in her designation, and that the ship should bear a name. It will be noted that a priority list for naming of new construction submarines was established...and that 'ALBACORE' is the next name on the list.

"It is therefore recommended that: a) subject vessel be classified AG(SST)-1; b) subject vessel be named ALBACORE. Signature: C.B. Momsen, R. Adm. USN, ACNO (Undersea Warfare)."■

SEVERODVINSK CLASS
RUSSIAN NUCLEAR ATTACK SUBMARINE

by Dr. George Sviatov
CAPT 1 Rank, Russian Navy(Ret.)

Editor's Note: Dr. Sviatov currently is a Director of a company involved in U.S./Russian trade. While on active duty he was a submarine designer.

Introduction

As the United States was building the Seawolf class nuclear attack submarines, and designing and building the New Nuclear Attack Submarine (NSSN or Virginia class), Russia finished building its Acula II (Project 971) SSN and Oscar II (Project 949A) SSGN and began construction of the Severodvinsk class (Project 885) SSN (or more exactly SSN/SSGN).

Existence in the Soviet and Russian Navy of modern individual SSGN class submarines is the result of cruise missile designers' domination in submarine designing and building, and the wish of the Navy's leadership to get long range supersonic, larger caliber, submarine cruise missiles as soon as possible for creation of a serious missile threat to American aircraft carrier groups.

The ultimate result of that long way of development (it commenced in the beginning of 1960s with the Papa (Project 661) SSGN titanium nuclear submarine with 10-1,600 mm caliber Ametist cruise missiles, 12-533 mm torpedoes and more then 44 knots speed) and had become Project 949A Oscar class SSGN nuclear submarines which have a submerged displacement of 24,000 tons, 24 Granit supersonic cruise missiles, 4-650 mm and 4-533 mm torpedo tubes and 24 torpedoes and torpedo size missiles, and a speed of up to 33 knots with a test depth of 600 m. The designer of Oscar was the St. Petersburg's Rubin Design Bureau, a competitor of the Malachit Bureau which designed Severodvinsk.

But the major prototype of Severodvinsk is the Project 971 Improved Acula class nuclear attack submarine. In the 1984-1997 period the Soviet and Russian shipbuilding industry built 16 submarines of that class which are the most stealthy, deep diving, fast and heavily armed Russian nuclear attack submarines, compa-

rable to the United States Seawolf class. This Russian submarine, with a submerged displacement of 12,770 tons, 4-650 mm and 4-533 mm bow torpedo tubes and 40 torpedoes and missiles, a speed of 33 knots and a test depth of 600 m, is the best product of the St. Petersburg's Marine Bureau of Machinebuilding (SPBM), Malachit and Komsomolsk and Severodvinsk shipyards.

What is Known About the Severodvinsk SSN?

Despite the unprecedented openness of Russian publications in recent years, official information about the newest Russian nuclear submarine is limited because of its classified character. Nevertheless, some things are available, mainly from Russian and American publications.

It is known that the Severodvinsk Project 885 SSN is a Russian nuclear submarine of the fourth generation. The Project was developed in the period from the end of the 1980s to the middle of the 1990s by the St. Petersburg's Malachit Design Bureau (Head and General Designer A.V.Kuteinikov) under the leadership of General Designer V.N.Pyalov, which also developed the well established Project 971 Bars—or in U.S. terminology, Acula class SSN.

It should be noted that before Severodvinsk, the Malachit Bureau developed a Project 971 version with 8-533 mm torpedo tubes and 40 weapons and the new antiship cruise missile Biruza, and a version with 12-533 mm torpedo tubes and 50 weapons and a new big diameter spherical sonar array and side arrays.

Laying down of the lead Project 885 submarine, which was named SEVERODVINSK, took place on 21 December, 1993 at the famous huge Severodvinsk shipyard which built almost as many nuclear submarines as all the shipyards in the United States of America.

It was expected that the lead submarine would be commissioned in 2000, and later six more submarines will be built. These subs will have to provide the main body of the new Russian Fleet.

Creation of this submarine coincided with the country's (and its economy's) transitional period. The social system crisis, progressing deindustrialization, and the collapse of economic connections with former Soviet Republics drastically complicated delivery of contractors' equipment and weapons. It negatively influenced

building programs of the third generation submarines' and the tempo of the fourth generation submarines design and construction.

To overcome all of these problems it was necessary for the Malachit Design Bureau to struggle constantly for the survivability of Project 885.

The building pace was slowing down for SEVERODVINSK because of insufficient financing of the ship's improvements required in the process of her building. The Malachit Bureau solved this problem successfully, showing a big potential of Project 885 modernization. As a result it became possible to broaden the ship's combat missions significantly.

For example, initially, a fourth generation submarine building program had three submarine classes: 1) anti-submarine; 2) anti-aircraft carriers; 3) anti-surface warships and transports. General development of submarines in various countries and economic factors in Russia demanded cancellation of this approach with several classes and narrow specialization. To realize the fourth generation nuclear attack submarines development, only one class ship was chosen—Project 885 SSN, which, after the finishing of her technical project, had been equipped with new weapons for solving broadened tasks. As a result, by opinion of Malachit designers, Project 885 submarine became a truly universal submarine—a new step in the development of a multipurpose submarine concept and naval architectural image.

The submarine will be significantly different in comparison with a Bars (Acula) submarine. For the first time in the history of Soviet and Russian submarine development its sonar array will be spherical (with a diameter of some 7 m) and will be placed in the extreme forward part of the sub, not sharing space with torpedo tubes. Russian submariners can say: "it is better to get it late then never." The 8-533 mm torpedo tubes and 32 reserve torpedoes will be shifted back and placed approximately in a scheme such as on the Seawolf class U.S. subs.

From these torpedo tubes, which will be inclined to the ship's centerline approximately 8 degrees, it will be possible to use all kinds of homing and wire guided torpedoes, missile-torpedoes and cruise missiles, including the supersonic (3.5 Mach) Alfa anti-ship cruise missiles with a range of more then 100 miles and the anti-land Granat cruise missiles with a range of up to 3,000 km. New models of mines will be installed also.

Traditional SSN torpedo-missile weapons will be supplemented with 8 vertical missile tubes of some 1.6 m diameter placed in an additional compartment. This compartment will carry Oscar class submarine weapons: RK-55 or RKB-500 very long range anti-land cruise missiles and X-35 and P-100 (Onix) anti-ship big supersonic cruise missiles. The Severodvinsk designers believe this composition of missile weapons will allow the submarine to strike land targets and surface ships more efficiently.

The quietness level of Severodvinsk will be the same as the newest Bars class submarines, or better, because of natural progress in submarine quieting development.

In an official U.S. Navy's publication some information about the SEVERODVINSK and an artist's depiction have been presented. The general information is approximately the same as in Russian publications and the artist's depiction is probably almost correct. But only almost.

In this depiction the submarine has 9 compartments. After the big spherical array there is I small compartment—sonar equipment and living, then II compartment—control room, living and sonar equipment, the III compartment-torpedo room and living, then IV compartment—missile, then V compartment—living(?), then VI compartment—reactor, then VII compartment—auxiliary mechanisms, then VIII compartment—turbine, then IX compartment—electric motor, rudders and planes devices.

A Net Assessment of Published Information

This artist and his advisers evidently underestimated abilities of Russian naval architects as designers of submarines. So, let us begin with a probable general arrangement naval architectural scheme.

- Bow part—spherical sonar array with a diameter of some 7 m of the Irtish-Amphora hydroacoustic station and #1 ballast tank.
- I compartment—sonar equipment and storage battery.
- II—torpedoes and living.
- III compartment—control room, periscopes and living
- IV compartment—radio, radar, sonar and other electronics rooms, other masts, diesel-generator and other auxiliary mechanisms.

- V compartment—missile room and living.
- VI compartment—reactor, upper part of which is separated by a pressure deck with biological shield.
- VII compartment—turbine with autonomous electrical turbo generators.
- VIII compartment—auxiliary mechanisms, rudders and planes devises.
- Stern part—stabilizers, rudders and planes, propeller.

In a recent Malachit author's publication it says that the Severodvinsk will have such characteristics: missile launchers with big cruise missiles—up to 8-650 mm torpedo tubes, 4-533 mm torpedo tubes and a surfaced displacement of 9,500 t, a submerged displacement of 11,800 t, with a length of 120 m, a beam of 15 m, a 10 m draft, a 28 knots speed, and a complement of 85. Data about the number of torpedo size weapons, test depth and power are absent.

It seems that more probable Severodvinsk characteristics are:

Surfaced displacement	9,500 t
Submerged displacement	14,000 t
Length	120 m
Beam	13.6 m
Draft	9.7 m
Reserve of buoyancy	23%-25%
Surface unsinkability	with one flooded compartment
Test depth	600 m
Hull material	AK-32 steel with yield point 100 kg/sq. mm
Torpedo tubes, amidships	8-533 mm
533 mm torpedoes and cruise missiles	40
1,600-mm vertical launchers and big cruise missiles	8
Sonar	Irtish-Amphora with spherical bow, side and towed arrays
Underwater speed	32-33 knots
Reactor	some 200 mgwt, with high degree of natural circulation
Turbine	1, some 50,000 shp
Manning	85 officers, petty officers and men

Conclusion

In designing the fourth generation SSN, Russians did not go by the American way; they did not reduce displacement, diving depth, speed and number of torpedo tubes and weapons. They eliminated the 650 mm torpedo tubes and torpedoes because they did not have significant advantages in comparison with 533-mm torpedoes and missiles, but they added 8-1,600-mm vertical big cruise missile launchers inside the pressure hull.

It seems that the latter decision is wrong because it is an inheritance of old Soviet design philosophy to put cruise missiles with more than 533 mm diameter on submarines. Now Russians have anti-land 533 mm cruise missiles with a range of 3,000 km and supersonic anti-ship 533 mm cruise missiles with a range up to 200 km and very effective anti-submarine and anti-ship 533-mm torpedoes (by the way, Russian 533 mm torpedoes are 2 meters longer than American torpedoes).

It is this author's opinion that the future of SSNs is not connected with the increasing number of missile launchers but with keeping 8-12 533 mm torpedo/missile tubes and increasing the number of their weapons up to 80-100 with fast reloadable firing systems. Such a fast firing tempo is difficult to accomplish with wire guided torpedoes but much easier with cruise missiles.■

TACTICAL NUCLEAR DETERRENCE BY THE NAVAL RESERVES

by LT Douglas E. Reckamp, USN
Navigation Officer, USS MICHIGAN (Blue)

Editor's Note: Lieutenant Reckamp's paper won The Naval Submarine League Essay Contest for Submarine Officers' Advanced Class 98030 in July of 1998.

A major mission of the modern U.S. SSN may be in peril. We are on an incremental path towards completely losing the capability to deploy tactical nuclear warheads on submarine launched Tomahawk Land Attack Missiles (TLAM-N). There are several reasons that we seem to be on this path, and those reasons are interrelated. In short, they can be summarized by the following: institutional distaste in the attack submarine community for the mission, the extensive administrative burdens associated with a nuclear weapons program, a perceived lack of importance of the mission in the evolving global political climate, and the ever present tightening budgetary concerns. We will look at the relationships between the many reasons, then examine a possible solution in the utilization of U.S. Naval Reservists in order to augment regenerating SSNs (SSNs tasked with loading and deploying with the TLAM-N).

My perspective regarding the attitudes and perceptions of submarine officers is as a Submarine Officer Advanced Course (SOAC) student in a class of submariners preparing to relieve as department heads. The general perception is that you are lucky if you are going to a submarine that is simply not capable of regeneration. This is in direct opposition to just about any other combat mission capability. No one feels lucky to get a boat that can't shoot ADCAP torpedoes, can't talk to the battlegroup, can't vertically launch Tomahawks, or can't go under ice. I'm sure everyone would prefer their upcoming tour to be on a platform with the best capabilities in every mission area that submarines could possibly be tasked to perform. Why is it, then, that professional submarine officers would be relieved to know that they are incapable of performing a major Submarine Force mission?

In a previous essay that won the SOAC Naval Submarine League essay award, Lieutenant Michael Kostiuk proposed a "Removal of the Nuclear Strike Option from U.S. Attack Subma-

rines." The reasoning he uses to defend his proposition is the redundancy provided by other legs of the strategic triad. He refers to TLAM-N as the "fourth leg" of the triad.[1] Therefore, based on budgetary concerns and a perceived lack of added value to our strategic deterrence, he argues for a removal of the TLAM-N from the U.S. arsenal.

The nuclear triad of strategic forces represent precisely that--a *strategic* force. If deployed TLAM-N assets in the past have represented some strategic value, that does not take away from the primary nature of the TLAM as a *tactical* weapon. Kostiuk takes the position that the TLAM-N is not needed since the U.S. had the chance to use it as a tactical weapon (in operations El Dorado Canyon and Desert Storm), but subsequently chose not to.[2] This argument totally misses the point of the U.S. policy regarding weapons of mass destruction (WMD). Their existence in the U.S. arsenal is a deterrent. That deterrence can be a tactical one for a regional conflict, or a strategic one for a global conflict.

Let's follow this thought with an example from Operation Desert Storm. According to General Colin Powell in his autobiography, "one biological agent we believed the Iraqis possessed was botulinum toxin, one of the deadliest known to man."[3] We also know for a fact that Hussein possessed chemical agents and showed a willingness to use them against his own population. After swearing to fight *the Mother of all Battles*, why did Hussein refrain from using his available WMD? If he had, isn't it entirely possible that a large number of U.S. casualties would have resulted? How would U.S. foreign policy options, public support for the war, and support for future actions against a belligerent aggressor have been affected by a large scale U.S. loss of life in that conflict?

There may have been several complex interacting reasons for Hussein's restraint from the WMD threshold, but I will submit that one of the overriding considerations was his knowledge that we were capable of responding to his use of WMD with our own, and he would not survive the exchange. Powell states "...germ warfare would be terrifying...If we faced unconventional attacks, we had unconventional counterstrikes ready."[4] In the case of Desert Storm, the U.S. was not planning on responding to WMD use with nuclear options, but according to Powell, they *were* investigated. He says: "I told Tom Kelly to gather a handful of people in the most secure cell in the building to work out nuclear strike options..."[5] While tactical nuclear options were not practical against an armored division dispersed in a desert environment, they may be in a

situation like the Korean peninsula. In any case, I submit that the very existence of a nuclear strike option may have been a major factor in Hussein's decision to use restraint.

Now we will address the argument that this deterrence can be accomplished by our strategic triad. Could we have executed a tactical option with our strategic triad forces? An ICBM launched from a CONUS location would overfly Russia or China on its way to almost any regional conflict. This is obviously unacceptable due to their possible reactions to such a threat. An SSBN is certainly capable of performing the same mission with similar accuracy, but the execution would either be incredibly wasteful or excessively violent due to the number of warheads in a single missile. Bombers have essentially been stood down from the triad (I would say that their leg in the triad has *taken a knee*), but are certainly capable of this type of a nuclear option.

A bomber would be a likely candidate for a tactical strike in a regional conflict. However, the value to a theater commander of a submerged, undetectable, stealthy submarine continuously on station in theater and ready to execute immediately upon National Command Authority authorization is incalculable. If the U.S. ever needs to stand shoulder to shoulder with South Korean forces against a full scale rapidly advancing combined arms force descending from the North, these capabilities may be the only reason those U.S. and ROK forces do not also have to contend with the nuclear, biological, and chemical attacks on them as well.

These arguments are not lost on most submarine officers. Most accept the utility of nuclear strike capability as a deterrent force and accept it as a valid submarine mission. However, I still see the prospective weapons officer being told by peers that he is lucky if his submarine is not tasked with regeneration. I think the real reason for this attitude is the massive administrative burden of the task. The professional knowledge and experience needed competently to provide for nuclear weapons safety, security, and execution are extensive to say the least.

SSBN weapons officers are sent to an additional six *months* of school after their SOAC classmates have relieved their counterparts and are serving as department heads. After the additional schooling, prospective SSBN weapons officers still cannot take their job until they have spent a deterrent patrol observing and under the tutelage of a serving weapons officer. This is the training it takes to get a professional in the arena of nuclear weapons.

The knowledge of special personnel requirements, administra-

tive controls, security areas, weapons movements, access restrictions, and command and control is imparted to the crew of a regenerating SSN in about *one week*. As training budgets contract, the training facilities that provide continuing training in those areas can no longer afford to send mobile teams to all submarine home ports. Submarines expected to maintain a sufficient number of trained people on board are required to spend valuable training travel money to send people to remote locations to learn a mission with which they may never get tasked and for which they will only rarely be inspected. A submarine commanding officer may decide that the bare minimum requirement of TLAM-N trained personnel is more than enough, when the budget cuts get down to the quick.

The corporate knowledge from the Cold War days is moving up and out of the Navy, and we are not training to replace it. The number of submariners used to driving around hot-bunked next to a SUBROC and knowing how differently to respond to a 4FZ alarm (a nuclear weapons associated alarm) compared to other security violations is slowly dwindling.

How do we address this problem? To raise the training requirements and elevate the level of concern shipboard may not be the right answer. The mission may have legitimately dropped down the ladder of importance and thus the ladder of concern. It takes a lot of effort and concern in order to reach and maintain the high level of proficiency required to run a nuclear weapons program painlessly. There really are just so many training dollars and they may well be better spent on shallow water coordinated operations training. However, the mission is still a valid one and must be maintained.

I propose that we utilize a largely untapped (by the Submarine Force) resource, the U.S. Naval Reserves. Currently, it seems like submariners transferring to the fleet reserves end up in surface battlegroup augmentation staffs. What happens to the Submarine Force itself if a national surge is required in response to a regional conflict?...comparatively little. Submariners that transfer to the reserves largely represent a lost asset to the Submarine Force (however great an asset they may be to the surface Navy). Many of these current reservists are precisely the Cold War warriors I referred to above.

The professional expertise required to administer a successful nuclear weapons program seems uniquely suited to a reservist task. One weekend a month to give continuing training to keep current, and two weeks a year to participate in a regeneration exercise of an

operational SSN. When an SSN is actually tasked with regeneration, the reservists are called up to augment the crew. The reservists implement the required programs, perform the crew screenings, load the weapons, and provide organic training assets to the rest of the crew through the deployment

> "I believe the proliferation of weapons of mass destruction presents the greatest threat that the world has ever known. We are finding more and more countries who are acquiring technology—not only missile technology—and are developing chemical weapons and biological weapons capabilities to be used in theater and also on a long-range basis. So I think that is perhaps the greatest threat that any of us will face in the coming years."
> (From Secretary Cohen's confirmation hearing, January 1997)

A crucial tool for facing that threat from WMD is the capability of employing tactical submarine launched nuclear weapons. We are slowly eroding that capability with reduced funding, unrealistic training expectations, and normal attrition from the Submarine Force. The task of maintaining that ability seems uniquely suited to a reserve unit's capabilities. The lack of many submarine specific reserve positions may steer more submariners past the fleet reserve option when they leave the Navy. Let us maintain the most flexible option to counter the threat of WMD while at the same time utilizing the valuable untapped asset of the U.S. Naval Reserves for the Submarine Force.■

Notes

1. Kostiuk, LT Michael, "Removal of the Nuclear Strike Option from United States Attack Submarines", SOAC Class 97030, 23 July 97, winner of Submarine League essay award.
2. *Ibid.*
3. Powell, Gen Colin, My American Journey, w/Joseph E. Persico, Random House, 1995, p. 494.
4. Powell, p. 504.
5. Powell, p. 486.

DIESEL-AIPS: LOW DISPLACEMENT AS A WEAKNESS

by Joseph J. Buff

Editor's Note: Mr. Buff is a novelist currently writing on a submarine-related project.

The extreme quiet of a diesel sub on batteries is well known. Air independent propulsion (AIP) systems have been developed or proposed that would augment the diesel's engine-generator-motor set and battery bank to enhance the *indiscretion ratio* of these boats, i.e. improve their non-snorkeling submerged endurance. The smaller size of diesel and diesel-AIP boats (here collectively denoted SSK) could be seen as an advantage in littoral (shallow water and/or near-shore) as opposed to a nuclear powered fast attack sub (SSN).

This article will examine the relatively low displacement of representative modern SSKs compared to Western SSNs, and will argue that said feature of *enemy* SSKs is a significant weakness in real combat operations against the U.S., UK, and our allies.

The present writer in part takes a view as futurist. Some of the following discussion would apply over the next 10 to 15 years, as advanced off-board sensors and remote combat vehicles become operational with our nuclear hunter/killer fleets. This article will end with comments on anti-SSK strategy suggested by their low displacement disadvantages.

Surfaced Displacement Comparison

Consider the following data [1] on surfaced displacement in tons:

SSK		SSN	
Russian Improved Kilo	2350(a)	USS SEAWOLF (SSN21)	7460
German Klasse 212	1360(b)	USS MIAMI (688I)	6300
Swedish Type A-19	1380(c)	UK Astute Class (d)	5900

Notes: (a) no AIP. (b) Fuel cell AIP. (c) Stirling cycle AIP. (d) in service 2006.

The percentage of total displacement dedicated to combat

sensors and systems, weapons loadout and other stores, plus crew habitability tends to be similar for both SSKs and SSNs: approximately 13-14 percent [2]. Thus it can be said that **undersea warfighting payload** (defined here as the sum of these components of weight) may be, in absolute number of tons, 2.5 to 5 times as large for a SSN as for a SSK: between 185 and 320 tons for representative diesel or diesel-AIP boats, vice from 800 to 1000 tons for the SSNs. Furthermore, the reserve buoyancy (taken as submerged displacement minus surfaced displacement) of the SSN designs averages 2.3 times that of the SSKs. Why does this matter?

Warfighting Effectiveness

It seems inarguable that SSNs possess substantial advantages over SSKs (whether the latter are augmented with AIP systems or not), regarding a) rapid stealthy transit to and from the theater of operations, and b) continued rapid submerged movement during tactics in the OPAREA. The top **quiet** speeds of SEAWOLF and NSSN equal or exceed the **maximum** speeds of SSKs [1]. But the following additional capabilities are also needed for a submarine to complete its assigned missions and tasks successfully:

1. Sensors and systems. Active and passive sonars and signal processors. Radio, radar, laser, and other communications/connectivity equipment, and electronic support measures (ESM). Target motion analyzers, other weaponry controls, various computers and data storage capacity, and navigation systems.
2. Weapons and Vehicles Loadout. Torpedoes, missiles (both anti-shipping and land attack), and mines. Decoys and countermeasures. Unmanned undersea vehicles (UUVs), and unmanned aerial vehicles (UAVs). Remote control combat vehicles (Manta). Special operations transport (Advanced SEAL Delivery System). Counter-mine reconnaissance and removal gear (NMRS, LMRS).
3. Crew. Battle stations and section watchstanders. Approach and Fire Control Coordination talent, command infrastructure. Operators of C4I consoles, remote vehicle control/downlink consoles, sensors, navigation, engineering, and weapons

systems. Maintenance and damage control workers throughout the boat, including onboard data administrators and systems operators. Mess management/crew comfort personnel.

A submarine with smaller payload will perforce have less capacity in at least one, and almost certainly in all three of the above critical areas.

Crew size determines and limits the boat's ability to sustain prolonged combat action in a complex high threat environment. A diesel boat with a crew of two dozen (German, Swedish) or fifty (Russian) [1] may be less expensive to maintain and operate than a nuclear boat with a crew of well over one hundred [1], but during lengthy battlespace preparation and domination phases, a manpower advantage of up to five-to-one may prove decisive. The larger crew will be able to *outthink and outfight the other guy*, if only by being able to outlast him.

Firepower is crucial to deter or destroy a military opponent. Representative diesel torpedo loadouts are under 20 units [1]. For SSNs, loadouts can range from 24 for Los Angeles class boats through 36 for the Astute class, to 38 for NSSNs and about 50 for Seawolfs [1]. In a fast paced littoral melee, during which **anti-torpedo defenses** may come to play a significant role, **sustained rates of offensive fire** become important. The guy who runs low on ammo first, or who runs out altogether, is at a severe disadvantage. To the degree that UUVs and UAVs, mine countermeasures, and other off-board sensors and vehicles take up space and weight, there is less room for warshot torpedoes, missiles (including undersea-launched anti-aircraft missiles), and mines (which add weight even if worn externally). Thus if SSN and SSK carry equal numbers of non-warhead-bearing devices that are launched through the torpedo tubes, the SSN's advantage in raw killing power is **even greater** than total loadout figures would suggest.

Target detection and situational awareness are vital warfighting attributes supported by good C4I, connectivity hardware, and sensor suites. Once more, a larger displacement is desirable. As computer systems become miniaturized, more and more tasks are found for computers to perform. Increasingly sophisticated sonar capabilities such as wide aperture array correlograms, and sophisticated piloting aids such as high resolution gravimeters, take up space and weight. A boat with 2.5 to 5 times the payload for such equipment is 2.5 to 5 times as capable to win the battle. Further-

more, powerful active sonars require large electrical supplies that may drain a diesel's battery banks unacceptably—an SSN has unlimited generator capacity, though at the cost of greater noise. And size matters, too. The larger beam and length of an SSN (x2 relative to SSKs is representative) [1] provides a bow sphere with four times the surface area, and a wide aperture array with twice the aperture. This can be especially critical at times such as littoral melees when towed arrays are not deployed.

Survivability

A successful submarine design must not only be able to put weapons repeatedly on target, it must be able to avoid or overcome damage due to enemy near misses and direct hits. A larger displacement boat has the edge in several ways:

1. Flooding. A leak of a given cross sectional area at a given depth (pressure) will admit seawater into the boat at a rate independent of displacement and reserve buoyancy. Clearly, a larger boat has more time, before the ability to surface is completely lost, during which to control and repair damage resulting from or causing flooding. In addition, a larger boat (SSN) can be subdivided more readily into watertight compartments. Internal pressure bulkheads are very heavy. The German Klasse 212 design, for instance, has no internal subdivision against flooding.
2. Shock Isolation. Shock isolation and quieting gear work hand in hand. They take up space and weight. Distancing from the outer hull is an important means to protect crew and sensitive equipment from blast concussion.
3. Hull Thickness. To withstand a given pressure, everything else being equal, the thickness of the hull must be proportional to the beam. Thus, obviously, a large SSN needs a thicker hull to withstand the same test depth as a small SSK. However, some warhead effects (including directed energy weapons) act locally, in which case a thicker hull gives added protection just like tank armor. By virtue of its smaller size/displacement, the SSK in fact is forced to carry a thinner hull—otherwise it would just sink to the bottom, and stay there.

4. Volatile/Hazardous Substances. An SSN's nuclear reactor contains dangerous materials. However, modern AIP designs do as well. Air independent systems, whether based on internal or external combustion or fuel cells, require onboard supplies of liquid oxygen, liquid hydrogen, and/or high test peroxide. These are highly flammable and/or explosive. In addition, high-power-density batteries can operate at temperatures up to 1000 degrees Centigrade [1], a significant fire hazard.

Point 4 above is worth elaboration. It has been argued [2] that SSKs can be designed with the shielding and insulation needed for survivability, given that nuclear submarines have indeed been built (at least in some countries) with an outstanding record of reactor operating safety. However, three counter-arguments can be made:

1. Shielding and insulation require considerable weight. If an SSK design becomes weight-critical, safety may be compromised, perhaps unknowingly until the vessel enters battle.
2. Decades of experience and tradition may be required to assure ongoing safe handling of volatile substances in a combat or near combat (Cold War) environment. This culture exists in the U.S. and UK for SSNs (and SSBNs). It is unclear whether Admiral Rickover's legacy of quality control and personal accountability can possibly be replicated by aggressor nations (actual or hypothetical) for their current or planned AIP-equipped SSK fleets.
3. An oxygen or hydrogen fire/explosion or battery fire/explosion may immediately kill the SSK and its entire crew. In contrast, equipment and training exist to combat and contain radiological hazards from a limited reactor accident—shielding and redundancy are important components of the displacement of a nuclear submarine. If both SSK and SSN have casualties related to their air independent fuel systems, the SSN may be much better able to repair itself and keep on fighting.

Strategy Implications

An aggressor might seek to use its SSKs in one or more of several ways:

1. Acts of terror or war against Blue Force (U.S., UK, etc.) coastal population centers and military or industrial installations. (This would involve a lengthy transit and repeated snorkeling.)
2. Attacks against mid-ocean lines of communication (SLOCs), i.e. anti-shipping operations and commerce raiding. (This still requires a lengthy transit with high risk of detection.)
3. Defense of the aggressor's own local seaspace, to prevent Blue Force amphibious operations and/or land strikes that would bring down the in-power *evil* political regime.

In these three missions, SSKs have two apparent advantages. First, they cost perhaps one-fourth or one-fifth as much as a nuclear attack sub [1], so an aggressor can purchase many more of them for the same money. Second, to ultimately defeat that aggressor nation, however/wherever hostilities begin, we must eventually dominate their littoral, the home waters of their SSKs—and this is where their propulsion systems perform optimally, and where their difficulty of detection comes to the fore.

But if the arguments earlier in this discussion are accepted overall, then an SSN penetrating enemy waterspace has several counterbalancing strengths. Perhaps most critical is the classic one of **concentration of forces**. That is, an amount of money invested in one extremely capable boat (SSN) is better militarily than the same amount invested in several less capable boats (SSKs). When equipped with UUVs and UAVs, along with advanced mine and countermine capabilities and combatant minisubs, the SSN can indirectly reach into the shallowest waters to seek and destroy the enemy SSKs one by one. Clearly, a remotely controlled *probe* launched from an off shore SSN is much smaller and quieter than even the best SSK design, and it is also much cheaper and more expendable than the diesel-AIP boat lurking in the littoral. The apparent four- or five-to-one advantage in numbers of the SSK is turned on its head, to become an up to five-to-one advantage in concentrated fighting power (payload weight) for the SSN. This general argument is particularly true for submarines, where coordination among a submerged flotilla is extremely difficult. However, for this perspective to continue to hold true as the number of SSKs in the world constantly increases, clearly an adequately-sized SSN fleet is vital.

Once the aggressor's SSK fleet has been contained in its home waters, the enemy has at least three remaining options:

1. Keep its SSKs in-harbor as a force-in-being, representing a threat to any invasion by Blue Forces.
2. Actively engage Blue Force SSNs and their offboard/remote fighting vehicles, in the littoral and out in deeper water, in hopes of inflicting sufficient losses to force a withdrawal or stalemate, at lest politically if not militarily.
3. Sortie the SSKs but have them lurk in hiding as a threat and a deterrent, akin to SSBN tactics. Perhaps seek to refuel/reprovision them clandestinely at sea, or in harbors of nations friendly to the aggressor.

Tactics to counter these three options, respectively, would include:

1. Mine enemy harbor mouths. Attack enemy SSKs at the dock with missiles, and/or with special operations forces. (These are all missions for which modern SSNs are ideal, if not essential.)
2. As in 1, but also use to the maximum the SSN's superior sensor capabilities, weapons loadout, and warfighting endurance in a battle of mobility. Harass the SSKs constantly, and maintain a high rate of exchange of ordnance, non-reusable sensors, and expendable countermeasures. Do this by cooperating with airborne and surface weapons platforms and their active sonars. Also locate the enemy by LIDAR blue-green laser ASW detectors [3], portable/temporary SOSUS nets [4], MAD, and thermal and wake anomaly effects. Maintain connectivity with UUVs by high-bits-per-second wireless underwater acoustic mans, and do so from below periscope depth with surface and air units via sonobuoy-sized transceiver relay nodes [5]. Find bottomed SSKs using NMRS and LMRS, and prosecute them mercilessly.
3. As in 1 and 2, seek out the SSKs wherever they may be. Give them not a moment's peace. Deny them access to ports and tenders for replenishment, and sink or take down their milch cows. Deny the diesel crews their sleep and ruin their ability to think straight. Make every SSK mission a one-way

mission. Localize, demoralize, and destroy.

The advent of undersea photonics (LIDAR, bioluminescence detection [6] and advances in sonar signal processing will make it harder and harder for a diesel-AIP to use one traditional infiltration tactic, namely hiding under or in the wake of a surface vessel. LIDAR scanners may soon permit *delousing* simply by looking under the keel. And the tonals generated by SSK diesel engines and/or near-surface screw cavitation can presumably be picked out of other noise by an alert escort's or helo's sonar watch, when properly equipped. It can be expected than in any war or declared zone of exclusion, merchant ships on which to ply this tactic will be scarce indeed in any case.

The greatest threat presented by an SSK may therefore be a WMD (weapons of mass destruction) mission while *Allied* defenses are lulled in peacetime. Vigilance in USW by carrier battle groups on maneuvers, diligence in HUMINT and ELINT regarding enemy intentions and SSK fleet readiness and movements, and constant IUSS surveillance for suspicious diesel signatures on the high seas, will all give some protection. Once more, **numbers of SSNs on deployment are crucial.**

The WMD-laden SSK may be on a suicide mission as well. It is always wise for Blue Force commanders to assume enemy vessels are manned by determined opponents who will fight to the death in performance of their perceived duty. But for suicide forces, deterrence by the surety of mortal peril is simply not enough. A guaranteed hard kill is necessary, i.e. PK of virtually 100 percent for the defensive system overall. The discussion above about low displacement disadvantages and counter-tactics would still apply: the SSK must be forced to maneuver constantly while avoiding detection, and must be required to fight its way through a multi-layered active defense before reaching any high-value targets, all while lacking sustained high speed submerged endurance and without a large combat weapons/systems payload.

Conclusion

The small size of representative diesel-AIP submarine designs may be an important disadvantage to an aggressor nation dependent on such vessels. Tactics to exploit this weakness and deter/defeat

aggression would include forcing a prolonged and continuous fast-paced mobile battle for seaspace domination, in which the SSKs' fuels, weapons loadout, and crew are worked to exhaustion and their sources of replenishment are neutralized. Blue Force nuclear attack subs, with their larger payload capacity, unlimited high speed cruising and electrical supply, and enhanced survivability—busily deploying advanced combat sensors and systems, special operations teams, and off board littoral fighting vehicles and probes—will help assure the *good guys* remain fully combat effective until, with the lowest possible casualties and least collateral damage, victory and peace are finally achieved.

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PROJECT MAGNUM
Taking Submarine Design and Operations into the 21st Century

by Harold J. Armstrong

Mr. Armstrong is a member of the Royal Institute of Naval Architects, Chartered Engineer. He worked for the UK MoD for six years as a member of the Royal Corps of Naval Constructors and spent two years as the naval architect for a large Royal Navy Nuclear Submarine Project Team. At present he is involved with naval stealth technology programmes for the Royal Navy and other navies.

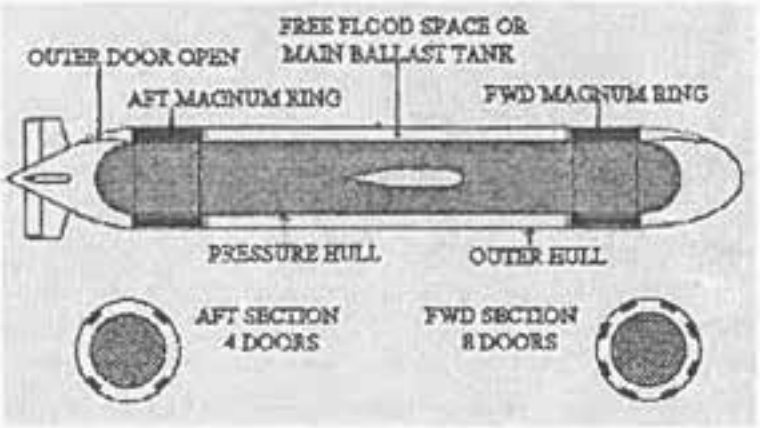
The investment that has been made into the design of submarines over the last 50 year since World War II has achieved significant improvements and benefits to their operational performance which was optimised for their Cold War NATO hunter killer role. At the same time, the slow evolutionary design process produced safe and gradual changes to the hull and on board systems, building on the accepted practices of previous successful designs. Only the adoption of nuclear steam plant in the 1950s stands out as a revolutionary step change in submarine design. Now accepted as the standard choice for large submarine main propulsion, at the time, the move to nuclear power was difficult and not universally accepted as the way forward.

One area of submarine design which has suffered from the evolutionary process is the weapon handling and discharge system (WHDS). With the need for new submarines to carry and launch existing weapons and for new weapon designs to be carried and launched by in-service submarines, WHDS has existed in a design *loop*. Although more sophisticated, a modern, conventionally armed SSN has less fire power today than a submarine 50 years ago when comparing their displacements. With the development of submarine launched cruise and anti-ship missiles, decoys and remotely operated underwater vehicles (ROVs), and the move towards a wider range of operational roles, the demands on space within the weapon stowage compartment can result in only a handful of heavyweight torpedoes being carried to sea. To overcome this constraint a new design of WHDS for submarines has been invented and patented. Called Magnum, the invention

places two rings of weapon canisters at either end of the pressure hull which are able to revolve around the outside of the hull inside a stand off secondary hull, allowing weapons to be fired fore and aft. Sketch 1 below shows a typical installation.

Sketch 1. Typical Installation

For a submarine similar to a SSN688 class, it would be feasible to fit 20 weapon canisters in each ring with each canister holding two weapons, creating a total weapon carrying capability equivalent

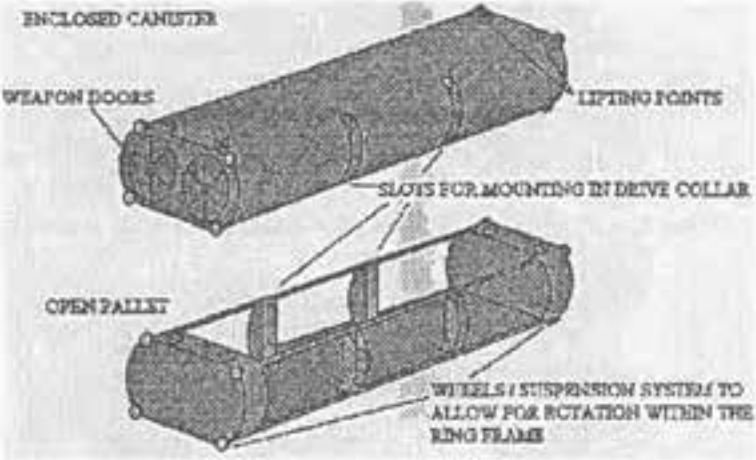


to 80 heavyweight torpedoes. With eight doors available to the forward ring, and four doors in the after ring, each revealing the complete face of a canister carrying two weapons, then with every door opened, the submarine would have 24 weapons ready for immediate launch.

The Weapons Canister

There are two types of weapon canisters; the enclosed pressure resistant version and the open pallet version. Both versions will be designed to a modular arrangement with common power and data interfaces. Sketch 2 illustrates each type.

Sketch 2. Canister Design



The enclosed canister will be designed to carry, side by side, two weapons equivalent to a heavyweight torpedo (Mk 48) or similar, such as a cruise missile (Tomahawk) or anti-ship missile (Sub-Harpoon). The diameter of the weapon could be as great as 30 inches although a range of smaller diameters would be equally acceptable by varying the internal sleeve diameter. It is therefore possible to carry existing 21 and 26 inch diameter weapons through the selection of the appropriate sleeve diameter, hence Magnum does not make the existing stock of in-service weapons obsolete. Within one ring of 20 canisters it would be feasible to carry 20 different pairs of weapons each with a different diameter. The weapons would be isolated inside their launch sleeves which in turn would be shock protected inside the canister. The canister would travel on a suspension system within the ring frame which in turn would be shock mounted to the pressure hull.

Power would be fed to the weapons and internal canister electronics through an induction loop system charging an internal battery at the rear of the canister and the data link would operate either through close proximity blue/green laser optics or RF frequency transmission. The canister would be designed with an external shell from a composite material such as carbon fibre or aramid fibre reinforced plastic, while the internal weapon sleeves would be designed to be pressure resistant to protect the weapon

from the hydrostatic pressures of deep diving. It is envisaged that the weapons would be stowed in a neutral, inert environment until required for launch. A gaseous medium would be drawn out and pumped into a small holding tank as the canister is flooded up immediately prior to launch.

The front of the canister would have two petal leaf door arrangements which would open outwards as the weapon is launched. The opening mechanism could be mechanical, operated from a small internal hydraulic accumulator, they could be opened by pressurising the canister from a normal below ambient internal pressure to a slightly higher pressure thereby pushing out the door sections or a frangible cover could be incorporated, designed to allow the emerging weapon to push through. Thus the weapons would be protected from shock, handling damage and a corrosive environment. The canister itself would be corrosion resistant and non-magnetic. The selected one shot launch system could be designed to eliminate all noise transients until the weapon was running.

The method of launching the weapon will now be selected by the weapon manufacturer who will be totally responsible for the internal design and arrangement of the canister, the only constraint being the overall modular, pre-specified external size and shape of the canister, its weight and common power and data links. The advantage of Magnum is that the launch system for each type of weapon can vary and the selected system will only need to be a one shot design. Possible launch systems, before the weapon's own propulsion system takes over, could be; a separate short lived boost motor (propeller driven or solid fuel rocket) pushing the weapon out from behind, a hydraulic ram operated from an accumulator, an air bag arrangement inflated via a gas generator or through a simple swim out arrangement.

It is expected that existing weapons would require minor modifications for their deployment in a Magnum canister, although future weapons would be designed from the outset for long term canister stowage and operations. This may mean that existing weapons would have a shorter maintenance cycle requiring the regular removal and testing of the canister and its weapons in a similar manner to air-to-air missiles fitted to the wings of fighter aircraft. Self checking systems in the canister, monitoring the health of the weapon and its internal support equipment, may help

to evaluate the need for maintenance and periodic service by reporting back faults to the submarine's main command and control system.

The canister would be designed to be overall neutrally buoyant, seawater would replace the weapon after launch thus eliminating the need for a dedicated weapon compensating tank. Any small variations would be accommodated in the submarine's main trim and compensating system.

A typical launch scenario would be:

1. A preparation to launch signal is passed from submarine command and control to the selected canister, or canisters, along with a fire control solution, which is constantly being updated from submarine sensors.
2. The weapon communicates its readiness status and on board three axis position data to allow confirmation of the range and bearing to target.
3. The signal to launch is given, the outer hull door is opened and confirmed. The canister is pressurised to slightly higher than the ambient water pressure allowing the segmented hatch at the front to open, followed by weapon launch.

If the weapon is wire guided then the wire will reel out from the inside of the front of the canister. This will mean that the outer hull door must remain open and the ring cannot turn until the wire has been cut. However, even with the ring stationary there will be the potential for another 15 weapons which can also be launched, the other ring will still remain operational.

After several years in service, when traditional submarine launched weapons (modified for their Magnum canister role) have become obsolete, new submarine launched weapons will have the ability to be designed without many of the constraints of the present system. The need to have 21 inch or 26 inch diameters with circular cross sections and launched by water ram discharge would be relaxed. They could have larger or smaller diameters, have a triangular cross section (if such a shape was desirable), fixed wings or over-sized control surfaces, be shorter in length or have a tandem configuration. It may be possible to carry an anti-aircraft missile system to deal with the threat from maritime patrol aircraft and dipping sonar helicopters. The forward ring would

carry mainly offensive weapons such as heavyweight torpedoes, anti-ship missiles and land attack weapons, while the aft ring could carry defensive weapons such as countermeasures, decoys, mines, ROVs and even rocket propelled anti-torpedo darts. However the ability to carry any weapon in either ring would be possible and desirable, a range of weapons in each ring would provide operational redundancy.

The canister would have small wheels attached to a suspension system to allow it to move inside the Magnum ring frame. Doors would be positioned on the top of the casing flat which, when opened, would allow empty canisters to be removed and full canisters to be inserted by being lowered into the ring frame. Two large, high torque slow moving hydraulic motors would be used to drive the canisters around the ring frame in 18 degree increments. Magnum eliminates the need to have a pressure hull hatch open to the sea for loading, thus allowing rapid reloading evolutions to take place at sea alongside a submarine tender or a Military Sealift Command vessel with the appropriate hydraulic crane and lifting frame. Canisters could be loaded onto a C-130 transport aircraft, carried on a truck or slung under a helicopter and taken to a submarine at short notice anywhere in the world.

The open canister would be designed to be a pallet to carry a variety of stores such as mines, special forces equipment, seabed sensor packages and remotely operated vehicles. The range of operations carried out by the ROVs could involve stealthy mine hunting and clearance duties, decoy activities, provision of a bistatic sonar platform, support to special forces with covert intelligence gathering activities, and peacetime support to search and rescue and environmental surveys. The variety of equipment described above would either be dropped from the pallets through keel doors located underneath the ring or accessed via the loading doors in the casing. With ROVs it is also envisaged that they will also be able to be captured by clamps built into the pallet once they have returned to the submarine and manoeuvred beneath the keel doors.

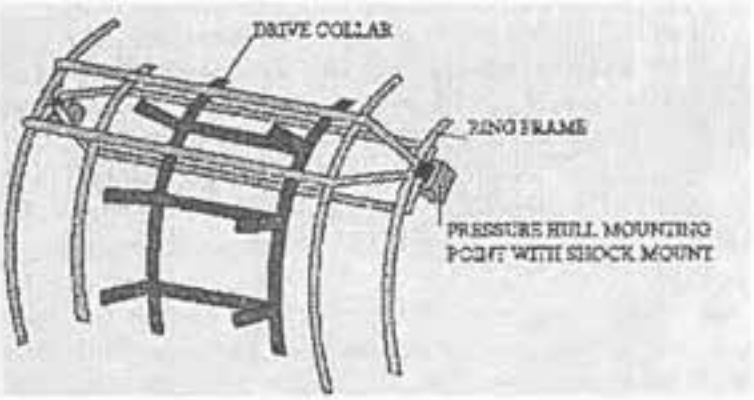
The Magnum design will therefore allow submarines to deploy remote mine hunting systems using submersible unmanned vehicles ahead of an expeditionary naval force allowing littoral and coastal minefields to be breached without the presence of MCM surface vessels revealing such an operation is in progress. It will also be

possible to fly out a special forces team, along with their combat gear stowed onto pallets, anywhere in the world in a transport plane and/or heavy lift helicopter to quickly deploy in a pre-positioned waiting submarine.

The Ring and Drive System

The ring frame would be manufactured from a high strength tubular steel to create a cage and rail system for the canisters and stores pallets to ride in. Within the frame there would be a drive collar free to rotate and driven by two high torque, low noise, slow moving hydraulic motors mounted 180 degrees from each other inside the pressure hull operating through shafts and sealed hull penetrations. One alone would be sufficient to rotate the drive collar. The canisters and pallets would be loaded into the ring frame through the top loading hatch and slotted into the drive collar while their wheel/suspension systems would then lock onto the frame rails. Thus the ring frame provides the main shock protection structure and the rails for the canisters to move in, and the drive collar securely locates each canister within the ring frame and provides the means for rotating the canisters. Sketch 3 below illustrates this arrangement.

Sketch 3. The Ring Frame and Drive Collar (Section Shown)



The ring frame would be mounted onto the pressure hull

through several regularly spaced shock mounts which would also serve to allow slow movement in the pressure hull, arising from contraction at deep diving depths, to be accommodated. A significant advantage of Magnum is the large reduction of pressure hull penetrations with the elimination of the torpedo tubes and a weapon compensating tank. It also allows the submarine to be reloaded without the danger of a pressure hull torpedo loading hatch open to the water. This means that both Magnum rings could be reloaded at the same time while alongside a submarine tender at sea.

Maintenance of the hydraulic motors and their control systems could be carried out afloat. If all the canisters are lifted out, the free flood ring space around the hull can be inspected by divers and cleaned out using high pressure water jetting equipment. It would also be possible to make the ring space water tight and pump it out to allow visual inspection and maintenance in the dry.

The Outer Doors

The outer doors would be simple flaps operated by hydraulics which would open to reveal the complete front of the canister with its twin segmented end caps. It is possible for the doors to be manufactured from a composite fibre reinforced plastic to reduce their weight, improve their dimensional tolerances and make them inherently damped thus making no noise when they are being opened. The same design strategy and materials can be employed on the top loading hatches and keel doors.

With the Magnum rings positioned at the ends of the pressure hull, the forward outer doors will be positioned further aft from the main bow sonar than with the present torpedo tube arrangement, thus allowing a larger bow sonar to be fitted with a greater spatial coverage as well as allowing a smoother flow regime to be maintained over the bow area and for a distance aft thereby reducing self noise.

The Data/Power Links

To allow the canisters and pallets to rotate within the ring frames, no simple hard wire connection will be possible, however early studies have shown that high speed data links could be

achieved through the use of laser. Short range RF transmission are also possible and a communication system could involve redundancy and safety cross checks as the onboard canisters computer and the main submarine command and control system (SCCS) transmit information back and forth.

The SCCS will be in communication with every weapon canister and stores pallet and will be displaying their operational readiness. If the tactical situation should suddenly change with the submarine in a land attack arrangement, for example by the detection of an enemy submarine, then the CO can rapidly demand a change in the submarine's capabilities which the SCCS will initiate by quickly turning both rings to present the number and type of weapons best able to meet the changing tactical circumstances.

Safety

In addition to significantly improving the operational performance of a submarine with reduced procurement and in-service maintenance costs, Magnum also improves safety for the crew by removing the danger of carrying explosives and toxic fuels inside the pressure hull. There will be a reduction in the number of pressure hull penetrations as well as the elimination of the torpedo tubes with their requirement for inner and outer tube door interlocks. A twin hull design will also offer greater protection for the crew against pressure hull penetration arising out of the impact from a shaped charge weapon.

Overall Submarine Design Factors

Direct handling of weapons by the crew, either through loading or via the racks within the weapon handling compartment (torpedo room), will no longer be required, while the complicated internal hydraulic and air conditioning systems in way of the weapon handling compartment will be simplified with the deletion of this space. The number of crew members therefore can be made smaller, thereby reducing demands even further on internal pressure hull volume.

Thus the shape of the submarine will create a length to beam ratio approaching the optimum as the overall diameter increases and the length of the pressure hull decreases with the reduced

demand on internal volume. This will result in an improved hydrodynamic form which will allow the submarine to go faster for the same installed shaft horsepower or, for the same operational speeds, allow the nuclear reactor greater longevity before (or even if) requiring refueling and also reduce coolant pump and reactor flow noise.

The space between the outer secondary hull and the pressure hull can be used efficiently to stow additional equipment, someof which at present may be inside the pressure hull. Certain tanks, such as fuel, hydraulic and fresh water, could be located in this space, the large sonar blister arrays fitted to the vessel's flanks could now be built in flush with the outer hull surface, while a proportion of the main ballast tank requirement could be located along the hull with their banks of air bottles. The twin hull design would also allow interacting twin coatings of acoustic cladding materials to be applied thus allowing for even greater reduction of radiated noise and target strength signatures.■

REUNION

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Ralph A. Kennedy
89 Laurelwood Road
Groton, CT 06340
(860) 445-6567

NAVAL SUBMARINE MEDICAL RESEARCH LABORATORY

Naval Submarine Base New London
Groton, Connecticut

by LT Walter Carr, MSC, USNR,
LT Deborah White, MSC, USNR
and Christine Schlichting, Ph.D.

The United States Submarine Service has a long and proud tradition of developing and using leading edge technologies. For over 50 years, the Naval Submarine Medical Research Laboratory (NSMRL) has been a major contributor to integrating these technologies into submarine and diving operations and to improving crew health and performance.

NSMRL began as a research section of the Naval Hospital Command at the New London Submarine Base in Groton, Connecticut. By 1946, NSMRL had evolved into a formal command under the Bureau of Medicine and Surgery (BUMED). NSMRL became responsible for selecting all officers and enlisted personnel for training at the Naval Submarine School, conducting specialized training in submarine medicine for hospital corpsmen and medical officers, and researching medical aspects of submarines and diving. This mission continues to be applicable today. Despite changes in name, personnel, and specific research topics, there has been considerable continuity in the research conducted at NSMRL over its history.

During and immediately following World War II, the Submarine Service was growing, and, as a result, there were many more applicants than could be accepted. NSMRL was tasked by fleet operations to refine the personnel selection procedures. From the lessons learned in submarine operations during the war, it was recognized that psychological factors and pitch discrimination were important characteristics to evaluate when determining an individual's ability to adapt and perform in the enclosed undersea environment of the submarine. Using this information, NSMRL developed the Submarine Psychological Testing Program, which is still employed today.

As the submarine continues to be improved and adapted to its changing role in naval operations, NSMRL continues to address important human issues to achieve optimum levels of operator and

medical performance. The tradition of *Rig for Red* in submarine lighting illustrates the research process. As early as 1941, NSMRL demonstrated that red light was best for preserving night vision and recommended its use to maintain dark adaptation for periscope operators. As time and technology progressed, both the advent of the nuclear submarine, which eliminated the need to bring submarines to the surface to snorkel, and the increased use of computerized display monitors reduced dependence on the periscope. Thus, preserving night vision to topside watchstanders and periscope operators was less of an issue. With these changes, NSMRL demonstrated that, although effective in maintaining dark adaptation, the traditional red light obscured colors on navigational charts and other displays. To address this problem, NSMRL verified that low level white light, in which people see colors accurately, was sufficient to preserve night vision.

Long-standing programs of research in personnel selection, night vision, and color vision are enhanced by the significant contributions of NSMRL has made in auditory and acoustic research, human factors engineering, biomedical science, and dentistry. NSMRL researchers are not always recognized on the submarine piers, but their footprint is readily apparent. Enlisted men and officers in the submarine service may remember completing a psychological inventory as well as hearing and color vision tests during their time at the Submarine School in Groton. NSMRL's research also includes the diving community (e.g., studies of nitrogen narcosis, development of saturation diving and decompression tables, and evaluation of the intelligibility of speech in a helium environment). In fact, NSMRL's contributions can be seen across the Navy (e.g. techniques for hearing conservation in noisy environments, the Farnsworth lantern, test of color vision, red and green signal lights, International Orange/Air-Sea Rescue Red). Benefits of NSMRL's research extend to other closed environments, such as those used by NASA and Antarctic expeditions. NSMRL continues to serve the fleet by taking the lead in undersea human factors, sensory sciences, and operational medicine.

NSMRL is keeping pace with the information revolution impacting both existing and new submarine platforms. Traditional research questions will continue to demand NSMRL's attention (e.g., submariner health and environmental conditions), but new

research questions need to be addressed in the face of new technology. Given simultaneous trends of submarine manning reductions and technology increases, there are human factors and cognitive issues that arise as fewer people are asked to handle more information. New information technology also presents benefits in that it can provide advantages in organizing and presenting large amounts of information in an intuitive manner. To capitalize on these advantages, NSMRL developed SEAREX, a computer-based system that presents an easy-to-follow series of steps to maximize safety and success during escape and rescue from a disabled submarine. Of course, NSMRL is not along in recognizing and addressing the impact of new technology on the submarine platform. On 11-13 May 1999, the Naval Submarine League will sponsor a classified Submarine Technology Symposium, ***Maritime Dominance Beyond 2015 Through Innovative Submarine Technology***. Eager representatives of NSMRL will be in attendance.

NSMRL is a BUMED command under Naval Health Research Center in San Diego. Captain Mark T. Wooster, Medical Service Corps, USN, is NSMRL's current Commanding Officer. The laboratory is comprised of a diverse group of physicians, physiologists, psychologists, audiologists, and electrical, biomedical, and nuclear engineers. Information on current research at the laboratory and lists of technical reports and peer-reviewed papers published at NSMRL can be found on the command's website (http://www.nhrc.navy.mil/nsmrl/). We encourage participation and input by members of the submarine service and other interested parties on issues important to improving submarine and diving operations. The research world is fluid and personnel and topics change, but the primary focus of NSMRL will always be to assist submariners and divers and to be responsive to their needs.

The Submarine Force is essential to the nation's present and future security. NSMRL is in the unique position of being able to both anticipate and address the questions and concerns of the Submarine Force.■

IMPACT OF NETWORK CENTRIC WARFARE ON SUBMARINE OPERATIONS

by LT Oliver Lewis, USN
Engineer Officer
USS PITTSBURGH (SSN 720)

The U.S. Navy is looking to the idyllic concept of network centric warfare (NCW) to maintain our maritime force supremacy. The concept is an information-based approach to warfare that depends on the capabilities of all platforms and sensors acting in concert rather than as single units.[1] On a small scale this is not revolutionary—an E-2C Hawkeye can vector an F/A-18 to an incoming bogey; one Aegis ship can launch another ship's weapons at a target held by a third; but this is new territory for the Submarine Force. Although the submarine is an integrated member of the carrier battlegroup, it cannot share information, direct weapons employment, or coordinate engagement in the same manner. If NCW is fully embraced by the U.S. Navy, the Submarine Force faces significant issues regarding connectivity, stealth, and tactical employment. (Whether NCW is wise to pursue as a Navy is under scrutiny. Unresolved concerns include information quality, network reliability and centralized decision making; these are not discussed in this paper as they are not particular to the Submarine Force.)

Recent improvements in submarine connectivity are numerous. The installations of UHF demand-assigned-multiplexing (DAMA) and EHF spectrum systems have hollowed out a bigger communications pipe than we previously imagined. Yet penetration of the ocean with anything other than a low frequency, low data rate signal eludes us. At depth, our communication capabilities rely entirely on one-way *bellringers* and voice or hard-copy UHF buoys. This prevents a submarine from participating as an equal partner in a unified command and control system. A submarine participating with the carrier battlegroup clearly recognizes this disadvantage. Even with the most advanced submarine communications suite deployed today, upon arrival at communica-

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[1] A.K. Cebrowski and J.J. Garstka, "Network Centric Warfare", *Proceedings*, January 1998, pp. 28-35.

tions depth, a request is sent to the Command and Control Warfare Commander's staff for a contact *data dump*. The entire tactical and intelligence picture for the past six to ten hours must be crafted for the submarine and sent out separately to be quickly digested by the sub commander and his advisors. Furthermore, the primary warfare commander is missing the piece of the puzzle the submarine holds. Real time data exchange between information systems is virtually non-existent with the exception of the 1970s technology of Link-11. The limitation of connectivity will only be solved by new technology to allow two-way satellite communications while operating deep and fast, or mitigated by a new generation of towed and expendable buoys with transmit and receive capability (UHF/EHF SATCOM voice and data). Our communication advances to date have not addressed these limitations.

Our modern role runs the gamut of intelligence gatherer, submarine hunter, ship killer, and Tomahawk shooter. Each role leverages off the advantage of stealth to varying degrees. It is our stealth that reduces our vulnerability to attack and even a general knowledge of our location is devastating, especially in the shallow confines of the littoral. Although NCW will certainly address concerns regarding emissions control, these controls will unlikely be restricted enough for submarines due to our extreme reliance on stealth. To maintain our covert posture our submarines primarily will be a recipient of the fused battlespace depiction, but wary to add more information.

The connectivity limitations and concerns regarding platform employment make the submarine an anomaly in the NCW concept. This is not to presuppose that NCW is folly for the Submarine Force; on the contrary, our submarine commanders will rely on the fused battlespace picture to dominate effectively the undersea battlespace. The Chief of Naval Operations, Admiral Johnson, stated that "With declining defense budgets, a combined arms approach that integrates our ASW systems and sensors into a network-centric architecture is imperative..."[2] This observation may hold true across the entire spectrum of warfare not just ASW, but the submarine is not just another member of the networked team. Our role is similar to that of a field scout or hidden sniper.

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[2] J. Johnson, "1998 ASW Focus Statement", July 19, 1998.

We achieve superior results with a clearly defined mission, accurate environmental intelligence, stealth, and proper on-scene decision making. The mission is lost if presence is revealed. Similarly, **effective employment of a submarine through NCW, and with the battlegroup in general, demands that it be treated as the unique platform it is, and not just another ship with a limited communications suite.**

Our stealth and independence make us the platform of choice for high-risk Tomahawk launch baskets, littoral and blue water undersea warfare, special warfare insertion, and coastal intelligence gathering. Accomplishing these missions demands operating at depth in some cases and with stealth in every case. Submarine operations in network centric warfare environment will accentuate severe submarine limitations. Nevertheless, we must leverage NCW advantages, build our future information systems with the submarine in mind, and design in enough flexibility to support theundersea guerrilla warrior.■

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 League prepares **REVIEW** copy for publication using Word Perfect. If possible to do so, accompaning a submission with a 3.5" diskette is of significant assistance in that process. Editing of articles for clarity may be necessary, since important ideas should be readily understood by the readers of the **REVIEW**.

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JOINT PROFESSIONAL MILITARY EDUCATION
A New Paradigm for Submarine Junior Officers

by LT Mark M. Marty, USN

Lieutenant Marty's paper won The Naval Submarine League Essay Contest for his class at the Submarine Officers Advanced Course. He is currently the Weapons Officer aboard USS NEBRASKA (SSBN 739).

In 1987, Congress passed the Goldwater Nichols Act requiring cooperation among the United States Armed Services. Included in this act was a new requirement that all officers promoted to flag rank must have served in a Joint Duty Assignment. (Over one-third of these billets require the completion of Joint Professional Military Education as a prerequisite). At the time the bill was passed only 25 submariners had served in a Joint Duty Assignment, so a temporary exemption was granted for the submariners to be promoted. Since this extension expired on January 1, 1997, the Submarine Force has been encouraging Joint Qualification by new opportunities to attend Joint Professional Education (JPME) courses.

The Goal

In order to be qualified and designated as a Joint Specialty Officer, the following milestones must be met:

1) Completion of Joint Professional Military Education (JPME) either by completing a War College resident program or completing JPME Phase 1 at any U.S. Service College and Phase II at the Armed Forces Staff College.
2) Completion of a qualifying Joint Duty Assignment (JDA).
3) Selection by the Navy Joint Specialty Officer Selection Board.
4) Approval by the Secretary of Defense.

Joint qualification is tracked in Block 72 of the Officer Data Card. This block contains Additional Qualification Designators, or AQDs, showing the progress of joint qualification. No Officer Data Card entry is made until one of the milestones is completed. The reference to interpret the codes on the ODC and get a good

brief of Joint Qualification is the annual Career Issue of *Perspectives*, published each January-February.

The Program

Joint Professional Military Education Phase I may be obtained through the Naval War College by completing three courses; Strategy and Policy, National Security Decision Making, and Joint Military Operations. The courses are presented in two forms—a non-resident seminar course and a correspondence course. An excellent guide to these courses is the United States Naval War College Nonresident Programs Information Guide, a 50 page pamphlet published annually, available through the Naval War College.

Seminar courses are normally held at larger bases, or fleet concentration areas one evening per week September through April, generally three hours per session. While preparation time varies, a thorough preparation generally takes approximately six to ten hours per week in addition to class time, test taking, and paper writing. A major emphasis in the seminar course is effective participation in the weekly seminars. Normally, several papers and tests are assigned, with papers being six to twelve pages in length and tests both of the take-home and in-class variety. Seminars range from class discussions to speakers from the NWC.

Topics covered in the courses include the following:

Strategy and Policy examines Clausewitz, Sun Tzu, Mahan, and a history of war from the Peloponnesian War through current strategy dilemmas.

National Security Decision Making examines the budgeting process, decision making models and strategy and force planning.

Joint Military Operations focuses on operational art, individual military force doctrine, joint operations planning, and culminates with a war game.

Joint Military Operations focuses on operational art, individual military force doctrine, joint operations planning, and culminates with a war game.

After completing JPME Phase I, Joint Professional Military Education Phase II may be obtained at the Armed Forces Staff College—possibly between assignments on the way to a joint billet.

Reasons to Pursue JPME

In Joint Vision 2010, the Chairman of the Joint Chiefs of Staff gives his view of joint education: "...without sacrificing their basic service competitiveness, these future leaders must be schooled in Joint Operations from the beginning of their careers."

One good reason to pursue the education is self interest. These courses are interesting, not only from a historical perspective, but also from a leadership and management perspective. During the study of Clausewitz in Strategy and Policy, the student learns leadership and the roles of subordinates in supporting the commanding officer. In National Security and Decision Making and Joint Maritime Operations, the student gets perhaps his first exposure to the budget process, force planning, and the study of joint operations. This information is interesting and valuable to any officer.

JPME can also serve as a stepping stone to a Master's Degree. Completing the non-resident seminar courses earns the student 21 graduate credits accredited by the New England Accreditation Board. Several colleges offer programs to count these credits toward a MA degree, including a Newport college, Salve Regina University. This school accepts 18 credits toward a Master's Degree and also offers the five additional courses (available via correspondence) required for the degree for about $5000 (not taking into account tuition assistance). This could fulfill two objectives for most officers, a Master's Degree and JPME Phase I.

Finally, a department head is one of the small group of submariners on board who possess advanced tactical training. The joint trained officer is very likely to provide unique insight to deployment preparation. Likewise, given today's missions and the possibility of a come-as-you-are war that will probably involve joint operations, a joint trained officer is likely to give superior input to the commanding officer.

Junior Officer Milestones

Once deciding to enroll in the JPME Phase I courses, a junior officer must develop a plan of action prior to rolling ashore in order to complete the program during his two-year shore tour and his time at SOAC. The program is designed to take one course per year making it very difficult to complete the three courses. The NWC does allow taking two classes simultaneously with special permission, thereby enabling a motivated JO to finish the courses

in two years; however, a JO must effectively plan how to fit the courses in during his shore tour. As already stated, the seminar courses are a considerable amount of work.

Assuming a junior officer completes two of the JPME Phase I courses while on shore tour, whether it be in the Nonresident Seminar Program or through correspondence, he has two opportunities to finish the program while at SOAC. Under a new program, SOAC students are being offered the opportunity to complete Strategy and Policy via a self-paced correspondence course. Approximately 15 percent of the students attending SOAC complete this Strategy and Policy course. If a student has any two courses completed, he could complete the final course via correspondence while at SOAC.

One significantly under utilized option for SOAC students is to complete one or two courses in Newport through the Nonresident Seminar Program. The commute to Newport from Groton is approximately 55 miles, or 80 minutes each way and SOAC classes rarely interfere with attending Newport classes. Although SOAC is six months long, many SOAC students could start courses during their shore tours via correspondence or the non-resident seminars and complete them in the Newport seminar program or vice versa. Not only would SOAC students benefit from attending courses in Newport, but the non-resident seminar courses would greatly benefit by having submariners attend the seminars to provide their unique perspective.

Recommendations

To promote JPME and make it easier for JOs to complete Phase I on shore tour, the author recommends the following actions for all submarine wardrooms:

1. Junior officers should routinely review both the Submarine Picture and the Joint Section of *Perspectives*.
2. All wardrooms should obtain a copy of the United States Naval War College Nonresident Programs Information Guide to increase the knowledge of the program. (This guide also provides information on courses presented at bases around the country.)
3. Senior officers familiar with the Joint Professional Military Education program should educate senior JOs ready to roll ashore about the benefits of JPME.■

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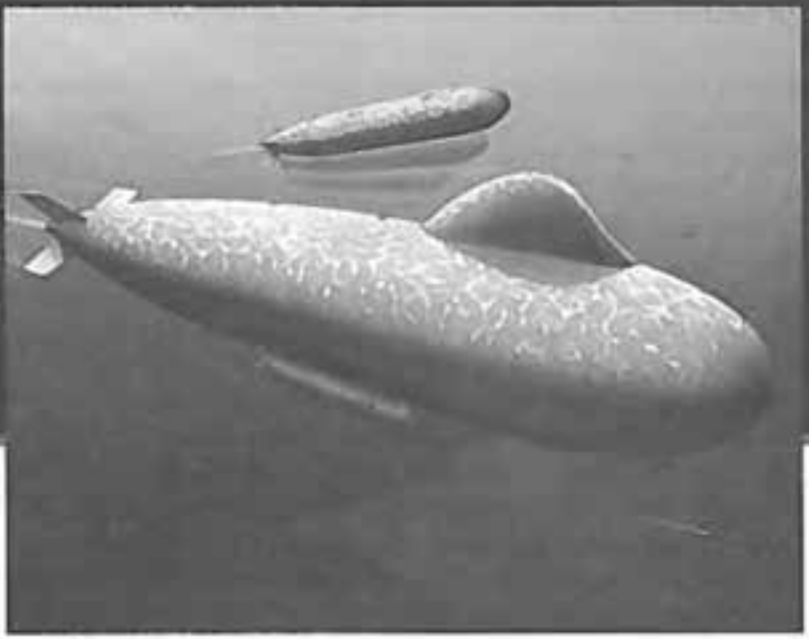

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SUBMARINE OFFICER DEVELOPMENT: CAN WE DO IT BETTER?

By Lt Michael J. Gabriel, Jr., USN
Weapons Officer
USS LOUISIANA (SSBN 743)(Blue)

Lieutenant Gabriel's article was selected as the winner of the Naval Submarine League's Essay Contest for Class 98040 of the Submarine Officer's Advanced Course.

The current training pipeline for submarine officers was developed to provide only the best and brightest nuclear trained officers to keep the reactors in the fleet safe. Without a doubt we can say, "Mission accomplished." Given this background, I ask two questions: 1) What price have we paid in achieving that goal? 2) Does every officer onboard really need to be nuclear trained?

While giving advice to his sons upon their commissioning, a Navy Captain passed along this little bit of advice to help them stand out among their peers: "Drive the ship professionally—most nuclear JOs can't."[1] I think that it is a great piece of advice, but should it be? The days of tracking the (noisy) bad guys in deep water are essentially over. We must place our emphasis on developing tactics and weapons systems for the littoral environment, to counter the increasingly more capable non-nuclear submarine.

I believe we have lost some of the tactical proficiency and innovation that was possessed by previous generations of submariners. The first three years of any submarine junior officer's career in the Navy is focused towards mastering the engineering plant. Of those three years, the first 15 months are spent in training commands, yet only three of those months are spent on non-nuclear training. A JO's first two years onboard are dedicated to initial qualifications and preparing for the engineer's exam, with the requirement that the officer spend at least one year as an engineering division officer. Most JOs spend two or more years in the Engineering Department. After about one year onboard, the JO

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[1]Leadership Forum: Ensign 101 by CAPT James P. Ransom, published in *Proceedings*, February 1995.

has earned his dolphins and is qualified to drive the boat. Are those qualifications as rigorous as the nuclear training he has been through and is still receiving? Surveying among my peers, the answer I received was a resounding "NO!" The tactical and ship handling development of JOs is left almost solely to the individual command. True, we have improved and standardized the process of non-nuclear qualifications and knowledge with the advent of the junior officer schools, but our actions overshadow the good intentions of these schools. Recently, one Submarine School instructor was heard lamenting that oftentimes JOs are called back to the boat from these schools for reasons such as drydocking the ship or performing intricate engineering evolutions. While attending these schools the JO usually retains all of his duties onboard, including standing duty during weekdays. Compare this to the efforts made by the boats to ensure that the JO is completely uninterrupted while studying for his engineer's exam at NEO school: usually two months with no divisional duties or responsibilities, and only weekend duty on the boat. We send a clear signal to the young impressionable JO at that point: "Mastering the forward end of the boat is not as important as mastering the aft end."

To be competitive in today's Submarine Force, an officer must prove himself in the nuclear arena. Some of the hurdles along the way include the initial training pipeline, qualifying as Engineering Officer of the Watch (EOOW) and then standing that watch during ORSE, as well as passing the engineer's exam. For career minded officers, the most sought after shore duties are billets that place them on the *fast track*. Those duties have traditionally included instructor duty at one of the prototype sites or at Nuclear Power School (now Naval Nuclear Power Training Command). Again, what kind of signal are we sending? Being a *heavy* nuke is the best, if not only, way to be competitive and to move up.

Only recently have we seen more than a smattering of COs and XOs that were not engineers during their department head tours. Thus, as could be predicted, the fleet's focus has been on safe reactor operations. Tactical thinking beyond the basics has routinely been left to be taught to prospective department heads while at SOAC. The JO schools do well to educate our JOs about the systems and operations of the forward end of the boat, but by comparison, it provides the equivalent of only a Basic Engineering

Qualification (BEQ) level of knowledge.

In this era of reduced numbers of submarines and submariners, we are looking high and low for ways to make the Submarine Force more viable and budgetarily competitive. With the deployment of the Tomahawk cruise missile we have adopted strike warfare. Since then we have had a steep learning curve in the employment of that weapon system. We relearned a costly lesson from World War II. Not only must we have a weapon system that works properly and has been thoroughly tested, but also a crew that knows how to employ that weapon system and practices it regularly. Why did this happen to us? Where was the emphasis of our training? I would hazard a guess and say that it was (effectively) not focused on shooting Tomahawks and was probably more concerned with safe reactors and shooting torpedoes in an open ocean (deep water) environment.

One possible solution is to operate our Submarine Force accessions more like our Royal Navy brethren. They split engineering and operations officers from the outset. There are advantages and disadvantages to this system. As a community we should analyze this as a serious option for the future.

One big advantage is the development of tactical thinkers at a *young age*. By allowing an officer to concentrate on driving the boat and thinking about tactics from day one, we can foster and will yield more tactically proficient submariners. As human beings, we improve with practice and repetition. I feel that some of our submariners should concentrate on the forward end of the boat while others focus aft. If we lock all our JOs in the engineroom from the outset, then we can reasonably expect good nuclear supervisors and poor ship drivers.

Another tremendous source of talent that the Submarine Force is all but ignoring is the submarine nuclear LDO community. Currently, as in the recent past, we have utilized LDOs for submarine new construction and refueling overhauls, with the understanding that it allows more line submariners to deploy, drive ships and become tactically proficient. This is a tremendous idea and should be enlarged to include nuclear LDOs in the wardroom on a permanent basis. The aircraft carriers have several nuclear LDOs assigned, why shouldn't we? After talking to several nuclear trained SWOs, the overriding opinion is that the LDOs are easily among the most knowledgeable and technically competent

nuclear trained personnel onboard. They have a tremendous base of technical knowledge and leadership experience that the seagoing Submarine Force is not utilizing and thus wasting. Why?

The idea of utilizing LDOs in the Engineering Department as division officers, and even as the engineer, creates some unique problems, yet has the potential to solve many others. True, we would have to create more LDOs, but that could actually help the accession rate and retention of nuclear trained enlisted personnel, which has been somewhat troublesome lately. There would be many more opportunities for them to *put on the khaki*, and thus we could attract and retain more talented people.

Another hurdle to be overcome would be mapping out the career progression of nuclear officers, nuclear LDOs and non-nuclear submarine officers up through a command tour. We could again study the Royal Navy's system, and adapt it as we saw fit.

With that course, however, we would have the difficulty of selecting Commanding Officers and Executive Officers that would have little or no nuclear training up to that point. This obstacle has actually already been overcome in the nuclear aircraft carrier/nuclear surface community. The CO and XO are (traditionally) aviators and their first taste of the nuclear world comes right before their tour as the XO of a nuclear powered aircraft carrier. The precedent has been set at Nuclear Power School, which has been slightly modified to teach these PXOs what is important, while allowing their non-aviator nuclear trained JO classmates to delve completely into the details of the plant and its operations. The nuclear training pipeline could be further modified to include a separate PXO/PCO course, taught at the level of detail and understanding required for continued safe reactor operations aboard submarines.

As of late, we, as submariners, have improved in our tactical warfighting skills, but I believe that this area is still hampered at times by a nuclear mentality.

In my opinion, the requirement that all submarine officers (with the exception of the Supply Officer) be nuclear trained should be carefully reevaluated. Shifting our Submarine Force to a *split* community would not be an easy transition, but in the long run could pay large dividends. It may save us submariners from extinction, or possibly (gasp!) bring a non-nuclear propelled submarine back into U.S. inventory.■

SUBMARINE RUSE OFF SWIFTSURE LIGHT

by CAPT Bill Ruhe, USN(Ret.)

On 5 November 1951, the submarine SEA DEVIL, with orders to conduct an Operational Readiness ASW exercise for the planes of a VP Squadron, hurried to get on station by 180–200 hundred miles off Swiftsure Light, which was sited at the entrance to Juan De Fuca Strait–at the top of the State of Washington The four foot seas encountered forced her to cut to two engine speed. Many of the submariners were seasick.

It was imperative that she start the ASW problem with a fully charged battery and 3000 pounds of high pressure air in the air banks–necessary for blowing the submarine to the surface frequently.

The exercise consisted of at least three VPs at all times, trying to prevent SEA DEVIL from arriving at a point 50 miles off Swiftsure Light. There, she would simulate the firing of missiles against an 80 mile segment of the Pacific coast south of Swiftsure Light.

It was the VPs' objective to exhaust SEA DEVIL's battery and high pressure air before she could reach the launch point for her missiles. The submarine would have to traverse more than 150 miles of ocean in her approach, and not be sunk by simulated depth charge attacks by any of the VP ASW aircraft. PDCs (small grenades) were to be employed, to mark by their explosions the possibility of the submarine being hit by these hand-dropped weapons from the aircraft.

A Lieutenant Commander Good, from the VP Squadron based at Whidbey Island (at the eastern end of the Strait of Juan De Fuca) was riding SEA DEVIL as an *observer*. But as he admitted, he was actually on board to make sure the VP attacks with the PDCs were honestly appraised by the submarine's personnel. He felt that he'd be able to tell by the loudness of the explosions of the grenades whether or not they would be lethal–if they were actual depth charges.

Good also inferred that his VP people were concerned about the tricks that a submarine might play to defeat an ASW aircraft's attempts to attack a sub with a high chance of success. But as the skipper of SEA DEVIL, I was equally worried about the ways in which the VP pilots might circumvent the rules for this exercise.

And rightly so!

As Lieutenant Commander Jake Vandergrift, the skipper of the submarine TILEFISH that had been relieved on the arrival of SEA DEVIL at Port Angeles (70 miles down the Strait) explained over some drinks prior to our being a target submarine for Whidbey Island VP aircraft: "You can count on the fly-fly boys fudging the rules on every ASW exercise. So you should pull out all the stops with every good ruse you can think of. Otherwise they'll get a grossly exaggerated and unwarranted sense of their capability to kill submarines as they please." Then, getting very patriotic he added, "It's for the best interests of the U.S. national security that the superiority of the submarine over the ASW aircraft be recognized."

Becoming very specific about VP malfeasances, Jake outlined what I could expect when I provided my submarine as an ASW target for a VP exercise. "First of all" he noted, "the artificialities of these ASW exercises will make you sick. But just go along with these aviators—they're just trying to look good." Jake observed that the VP pilots will stick close to the submarine as it proceeds to the starting point for an exercise. "They're not supposed to know where you are until after you first dive the boat. But they'll be hovering over the sub, or flying in a one mile circle around it. The pilots will have illegally learned the radio frequency of the umpire circuit and they'll have one of their receivers always monitoring it. Thus when you've got to come to the surface every hour and send a 'surfaced' message they'll know you're up somewhere on the ocean. Home Base wants this message sent 'for safety's sake'. But that's only an excuse to give the VP people a break. And then when you're driven down by an approaching aircraft you have to send 'diving'." Jake then generalized about VP operations, noting that at least three VPs will always be in use. And that they'll cover about a 10 mile circle around the sub's diving position to ensure that at least one will be close enough to detect the submarine on its surface-search radar even in the heaviest weather and be able to deliver a PDC just after the submarine submerged. "Your submarine won't be able to get in more than a 20 minute emergency charge on the batteries even if you use the ploy of taking a course away from the coast and do it at night. In the dark a VP can't visually identify a black, bobbing craft on the oceans as a submarine even if he shines his searchlight on his radar

target" Jake explained. "They'll have your battery exhausted before you get halfway to your missile launch point. To lick them you'll have to play a little dirty pool."

After more drinks with Jake the next night, I learned from Coast Guard aviators that Jake had embarrassed the VP flyers time and time again by not playing by *the rules*. One sorehead from Whidbey Island gratingly said, "And he laughs about it!"

Thus at 1801 on the 5th of November, I put Jake's advice to the test. Within seconds after diving to start the problem, a loud *Bang* was heard in the wardroom. Lieutenant Commander Good gloated: "That grenade was right on. He got us on that attack." To this, my Gunnery Officer angrily retorted: "That's the last time you're going to hear the grenade's explosion that close. After this all you'll hear is a muffled *pop* from a PDC at least 500 yards away."

And so for the next 26 hours with SEA DEVIL up and then back down every hour, all that were heard—barely—were harmless PDC explosions. But the routine of surfacing, hoping to put a few amps into the battery by heading away from the coast and acting innocent, didn't work.

By 2000 of the second day SEA DEVIL's battery was at a specific gravity of 1100—practically flat. In fact, some of the cells had started to reverse and had to be shorted out to slow the full exhaustion of the battery cells. Also, the high pressure air was perilously down to 1400 pounds, hardly enough to blow SEA DEVIL back to the surface. And, SEA DEVIL was still a good 80 miles from her missile launch point. In 26 hours, only 76 miles had been made good towards Swiftsure Light.

A ruse was necessary to save the day!

After much discussion by the submarine officers in the wardroom—with Lieutenant Commander Good smugly pooh-poohing all suggestions—a plan to outwit the VPs topside was initiated.

SEA DEVIL was surfaced on a course away from the coast. Her running lights were turned on. And a red light at the top of the shears with a white light six feet below it were lighted. These two lights disguised SEA DEVIL as a fishing boat—*Red over white. Fishing at night*—was well recognized by all seamen. So it was hoped that at least one of the VP pilots knew his seamenship. The radars were turned off and radio silence was observed. Three engines were started up with a loud roar and began pouring amps

into the batteries as rapidly as possible. The high pressure air compressors thundered as they jammed air into the air banks. Within a minute the word "diving" was transmitted, with SEA DEVIL remaining on the surface. The people in the VPs should be lulled into inactivity until a radar operator remembered that there was a new radar contact to be investigated.

The men on SEA DEVIL's bridge bent their ears to hear the sound of an approaching aircraft—and kept their fingers crossed.

Then, SEA DEVIL was steered to a course 40 degrees from that which would head her for Swiftsure Light. That should not brazenly suggest that the target submarine was heading into the coast for a missile launch.

Shortly, a VP winged its way in. And, at a mile's distance circled SEA DEVIL suspiciously. Apparently satisfied that his radar contact was merely a fishing craft, the VP failed to close SEA DEVIL and shine a searchlight on the black object bobbing on the ocean.

The seas were still running high, so speed was reduced to 12 knots. But that was enough to get SEA DEVIL to the 50 mile firing position off the coast before daylight. The hourly grenade drops had stopped after the ruse was initiated—much to Lieutenant Commander Good's bewilderment and disgust.

Thus the VPs were unaware of the ruse being employed and were first alerted to its success when: "SEA DEVIL at missile firing position" was transmitted on the umpire circuit. The follow-on message, also transmitted in plain language, delivered the bad news to the VPs everywhere: "Am securing from the problem and proceeding to Port Angeles." It was a *mission accomplished* sort of message.

"Not to worry" might have been added but that would only have rubbed it in—that submarines invariably had the upper hand over ASW aircraft.■

MEMORIES OF LOMBOK STRAIT
OR *RITES OF PASSAGE*

by CAPT R.C. Gillette, USN(Ret.)

Lombok Strait has a mystique all its own to the submariners operating out of Perth, Australia, during World War II.

The strait lies between the islands of Bali to the west and Lombok to the east. To the north is the Java Sea, to the south the Indian Ocean. It is about 15 miles wide east to west and 50 miles long north to south. It is deep and its currents are strong and variable--four to five knots. The direction of current flow is either north to south or reverse. Strangely, the north to south flow lasts for about 16 hours and the reverse about 8 hours. How the water from the Java Sea to the north is returned from the Indian Ocean to the south was a real mystery. The current characteristics resulted in the submarines mainly transiting on the surface at night. One submarine attempted a submerged transit from south to north but ended up hours later several miles south of her diving.

Using this strait for access to the convoy routes utilized by the Japanese, the submarines were able to interdict the routes and effectively cut off the supplies of oil and critical materials to Japan.

As mentioned before, to the submariners, Lombok had a unique aura of mystique unlike any of the many straits and bodies of water in which the submarines operated.

Transiting from either direction was always marked by a fundamental change in attitude of the ship's company. When going north, it brought home to the crew that there was a real war going on, and if they were going to survive, they had to concentrate on their mission. When clearing to the south, all hands spent considerable time getting ready for liberty in Perth, four days away. The amateur barber broke out his tools and the crew their address books and phone numbers, which were studied carefully.

LAPON made many transits of Lombok. As a result we came to believe that there appeared to be a mutually accepted truce between the Japanese patrol craft and U.S. submarines, that "if you let us chase you around a bit and don't shoot us up, we will return the compliment by letting you clear the strait without critical interference."

However, on many occasions, passage through Lombok Strait could be a memorable experience. On one such trip, Lombok

almost did LAPON in. We had encountered the usual patrol boats and had paid our customary dues playing a grim form of tag at full power. Finally, when we had broken out of the strait and were in the wide expanse of the northern throat, I went up to the bridge to relax a bit.

It was a beautiful night, with quite a lot of the usual phosphorescence in the water. Suddenly, the high lookout broke the silence as he bellowed, "Right full rudder!" Such action on the part of a lookout is very unusual, and immediately gets one's attention. My reaction was to look to port and was rewarded by seeing two phosphorescent torpedo tracks coming fast. There was no way of avoiding them as they were close aboard. The Pearly Gates were clanging loudly, as they either closed or opened, depending on one's background.

Suddenly, the torpedoes turned hard right and paralleled LAPON and escorted us along our way. Instead of two torpedoes, two porpoises had decided to give us a thrill. I then told the rest of the bridge watch, that any of them requiring a change of *skivvies* could join me below.

The apparent truce in Lombok Strait came to an abrupt end when our friendly British submarine allies, who were short legged and had difficulty finding suitable torpedo targets, decided to use their deck gun in Lombok. The British deck gun was designed so that it could be manned and made ready to fire without revealing that fact to an unsuspecting target. Further, the British submarine's silhouette was not unlike a Japanese R-O class submarine. This gun capability was demonstrated rather unfortunately by a British submarine skipper one sunny day when, while flying the Japanese flag, he approached one unsuspecting Japanese patrol craft and, at about 400 yards, blew it out of the water. This event caused considerable indigestion on the part of the Japanese high command. Shortly thereafter shore batteries and search lights were installed on the beach which abruptly terminated the mutual peace agreement. The event also brought down the wrath of Admiral Christie, the Force commander, along with that of all the U.S. submarine skippers. Fortunately the end of the war was fast approaching and only one submarine loss could possibly be attributed to the increased ASW attention given to Lombok by the Japanese.■

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Jay G. Wuerker

E-MAIL ADDRESSES

THE SUBMARINE REVIEW continues its list of E-Mail addresses with those received since the October issue. We can be reached at subleague@aol.com.

Allen, Todd, trallen@cyberhighway.net
Ambrose, Ike, i.ambrose@ozemail.com.au
Brayman, Thomas, COMPSC1419@aol.com
Brittain, Albert, brittain_bert@elsva.com
Brown, Dick, dbrown@tlinenm.com
Brown, Richard, city.of.nl@snet.net
Buff, Joseph, joebuff@interport.com
Chatham, Howard, howard.chatham@ascacc.com
Davis, Jay, jk&mbdavis@netos.com
Delaune, Ruby, delaune_ra@nns.com
Farmer, Mike, mike.farmer@pnl.gov
Fuller, Bill, wfulle@aol.com
Guth, James, jdguth@ix.netcom.com
Harmuth, Bob, saltymate@aol.com
Henderson, Nathan, hhen@ix.netcom.com
Hicks, William, WmMHicks@aol.com
Hollingsworth, Leland, Lholli8073@aol.com
Hughes, Joe, jbhughes@aol.com
Ingram, Steve, steve.ingram@ps.net
Kievit, John, kievit44@aol.com
Kill, John, subvet@pro-usa.net
King, Herb, hking@pinn.net
Lawton, William, blawton@idsonline.com
Maurer, John, Jmaurer403@aol.com
Maurer, Jr., John, JHMaurerJr@worldnet.att.net
McManus, Jr., Bob, mcmanus@nypost.com
Morrison, Alfred, fred.morrison@reentry.nswc.navy.mil
Mosier, Jr., John, jmosier@aloha.net
Mullin, Jack, jhmss322@aol.com
Nelson, Rick, rgnelson@gte.net
Oakes, Joseph, jcloakes@msn.com
Olson, Don, narwhald@aol.com
Ondish, Raymond, joco@erols.com
Peterson, Richard, dickpete@erols.com

Petnalle, Peter, Petnalle@aol.com
Philipps, Phil, CFOX402@aol.com
Reynolds, J. Guy, j_guy_reynolds@compuserve.com
Rindskopf, Maurice, mrindskopf@earthlink.net
Ruzic, Tom, truzic@cc.nns.com
Skorupski, Stan, SSSFMC@aol.com
Smith, Dan, dhsmith@gte.net
Smith, William M., SSN759C0@aol.com
Stafford, Calvin, pubsafety@subasenlon.navy.mil
Stallard, Clint, cstallard3@rocketmail.com
Strong, James, sa1106@aol.com
Szaszdi, Lajos, aszas@ids2.idsonline.com
Voelker, George, voelker@kpt.nuwc.navy.mil
von Suskil, James, von.suskil@worldnet.att.net
Watson, Michael, m_watson@uconect.net
Way, Richard, rfway@juno.com
Will, Linda, jmwlww@aol.com
Williams, Michael, Williamsmw@code83.npt.nuwc.navy.mil

Changes
Brandes, John, Jbrandes@msn.com
Buckley, W.C., buckssusn@aol.com
Enos, Ralph, renos@silverlink.net
Fritchman, Will, fritchmw@naples.navy.mil
Ghormley, Ralph, rmghormley@aol.com
Hack, Ted, coorion@aol.com
Holland, Jerry, hollandaj@aol.com
Ihrig, C.J., cjhrig@cc.nns.com
Lear, George, learbg@gwsmtp.nu.com
Loewenthal, Robert, bloewenthal@compuserve.com
MacVean, Charles, charles.r.macvean.59@alum.dartmouth.com
Manville, Ryan, Rjmanville@aol.com
Morgan, Frank, morgan1@nortelnetworks.com
Prisley, John, jpprisley@erols.com
Thompson, Richard, thompson@umaryland.edu
Toti, William, subcmdr@aol.com
White, Michael, m_j_white_680@hotmail.com
Will, John Alex, alex.will@aditech.com

MORE ABOUT PRINCIPLES UNDER DICTATORS

15 October 1998

Submitted by Dick Boyle

(Letters, p. 135, October 1998, THE SUBMARINE REVIEW)

If Lieutenant Commander Roitman cannot obtain a copy of Vause's Wolf, the following excerpt from his book covers the Kusch affair. I'm afraid this is the sum total of my knowledge. I checked Peter Padfield's The Last Führer, and Kusch is not in the index.

"Dönitz was an excellent leader, and it was probably his inspiration alone that kept the U-Bootwaffe going through the last two years of the war, but he wasn't perfect, especially if one realizes that his celebrated leadership style once killed a man. The man was Oskar Kusch, the commander of U-154, who blithely dumped the Führer's portrait into the trash one day. Kusch did not die in battle, in a training accident, or in a bombing raid. He was executed for sedition when his words and actions became too loud to ignore. Dönitz could easily have prevented it—there is little doubt that he would have done so in 1940 or 1941—but he chose to do nothing, and in doing nothing he never looked less inspiring.

"The 'Kusch affair' captured perfectly the moral dilemma faced by every member of the U-Bootwaffe, from Dönitz himself down to the least seaman and cook: the paradox of serving honorably a regime that was inherently dishonorable. Books too numerous to mention have been written about this dilemma and the mind-splitting problems it presented. Everyone handled it differently. Kusch, in confronting it, acquitted himself better than most, and it was odd that he did. Logically, he should have been enthusiastic about the Third Reich, for he was a product of the 'new Germany.' He grew up in Berlin, the seat of the new government. He was fourteen in 1933 when Adolf Hitler became chancellor. No doubt he heard the cheering; he may have seen the smoke rising from the Reichstag. The organization he joined as a boy, the Bundische Jugend, was soon swallowed up by the Hitler Youth. He was exposed to the deceits and subtle influences of the New Order in school, and when he left school he spent his mandatory year in the Reich Labor Service.

"But Kusch, like Oesten, was an early skeptic. In 1935 he left

the Hitler Youth and soon came under investigation for disloyalty. It is possible that he entered the Kriegsmarine in 1937 to avoid arrest, although his service record does not show any sign of trouble and in fact offers the picture of an above-average officer with several talents. In June 1941, after initial U-boat training, Kusch was assigned to U-103 as a watch officer. During his time on board U-103 he served under three different commanders, each of whom graded him highly. 'An excellent young officer,' wrote one. 'He has matured in the war; his impeccable disposition, his fine attitude and quickness of mind make him a valuable aid to the commander...he will be very well qualified to be a U-boat commander.' Oskar Kusch was an artist, a devout Christian, and a quiet man who kept to himself; to those who knew him he was pleasant, thoughtful, forthright in his views, and formidable in discussion.

"In February 1943, when Kusch first took command of U-154, the Battle of the Atlantic was approaching its end, and his fortunes as a commander reflected that decline. By the end of the year he had made two war patrols; during the first he sank one ship and damaged two others, but during the second he was unable even to approach the enemy, let alone attack. His skepticism increased and became vocal. He began to say what he thought, and he apparently did not care who in the boat heard him. He criticized the actions of the government and the high command and made rude jokes about the party. He began to complain about the boat, a type IXC built to a modified World War I design; she was out of date, obsolescent in the undersea war of 1943. He wondered out loud about the strategy he was trying to execute and even about the leaders he had to follow. He predicted Germany's loss within the year. Ordinarily such criticisms would have gone no further, even if others who heard them did not agree with them. Loyalties within the boat and the service would have prevented anyone from taking the matter further. Kusch, however, had the misfortune of having a first watch officer, Oberleutnant zur See Ulrich Abel, who was disdainful of Kusch personally, consumed with bitterness at having to serve under a man whom he considered his intellectual inferior, and ardent in his enthusiasm for National Socialism. In January 1944, in a detailed report to the Second U-Flotilla commander, Ernst Kals, Abel formally charged his commander with sedition and cowardice.

"The charges were ludicrous and should have been dealt with as such. 'The *crime* he was accused of was committed by more less all of us,' observed another commander, Eberhard Wallrodt,

'listening to enemy radio stations and talking disparagingly about the bigwigs.' Most accounts indicate that there was widespread dismay in the U-Bootwaffe officer corps that Abel had taken such a step. It was not the proper thing, and several officers tried to talk Abel into withdrawing the damning report. He refused, however, and Kals had no alternative but to initiate court-martial proceedings against Kusch. After preliminary investigations, during which the cowardice charge was thrown out, the trial began on 26 January 1944 in Kiel. Abel testified, as did three other officers in U-154; two backed his accusation, the third, a midshipman, was probably pushed into doing so. Kusch tried to put the best light on his actions, but he did not deny them, and he was convicted. Because of the nature of the charge, the president of the court had no choice but to sentence Kusch to death, and he did. At dawn on 12 May 1944 Oskar Kusch was taken from Kiel-Wik Naval Prison to a nearby rifle range. At 0632 he was shot by a firing squad. Two minutes later he was declared dead, and immediately after that he was placed in a plain service coffin for burial.

"It was a disgraceful episode in the short history of the U-Bootwaffe, and it reflected badly on almost everyone involved. Only Kusch himself rose above the tawdry mess. Aside from Abel, who is generally considered a reptile for having filed the charge, the worst loser was Karl Dönitz. His widely advertised bond with his men seems to have failed completely the day Kusch was accused. He accepted the charges against Kusch as truthful without investigating Abel, his motives, or his veracity. He approved the sentence of death and against the advice of several other officers, including former U-103 commander Werner Winter, declined to commute it. Gustav-Adolf Janssen, Kusch's last commanding officer in U-103, found himself traveling with Dönitz at that time from Lorient to Berlin by automobile; in a macabre replay of the 1940 Christmas encounter between Dönitz and Otto Kretschmer, he spent the entire journey trying in vain to persuade Dönitz to spare Kusch's life. Most puzzling, Dönitz, who was supposed to be so accessible and so solicitous, never met with Kusch from the day he was accused until the day he died. It is incomprehensible that he would abandon one of his own in such a way. 'Whatever the political environment may have been,' wrote Erich Topp, 'it would still have been in place here for Dönitz to speak to his commander at least once and to stand by him. Or was he so naive that he did not know what people were saying in the U-boat messes?'

"Most U-Bootwaffe officers did not know the details of the Kusch case while it was going on or even after Kusch was executed. For several reasons it was not widely reported. Those who are now familiar with it fall into predictable camps. Kusch was determined to bring about his own execution, wrote Karl-Friedrich Merten, and not even his best friends could talk him out of it. 'I have experienced types like him, He could not be considered as *normal*.' If he was not able to comply with the normal standards of a naval officer he could have found reasons to abandon [his position]. But he felt he must try the decisive point!' Erich Topp, not surprisingly, takes the opposite view: 'If we comprehend tradition as being in touch with and continuing lofty intellectual currents, then Sub-Lieutenant Kusch undoubtedly fits into this pattern, whereas Admiral of the Fleet Dönitz does not.' For Topp, Oskar Kusch is a true hero of Germany. After the war, as a senior officer in the Bundesmarine, he tried and failed to have Kusch memorialized in the fashion of Stauffenberg or Bonhoeffer. It is a measure of how far Topp himself came, for when asked whether he could have done what Kusch did, he replied with admirable candor that he could not.

"'Our fathers and ourselves sowed dragon's teeth.' When Oskar Kusch was shot, his father received a terse notification of his son's death, along with a warning not to publish a death notice. It is hard to know exactly how he felt, but ironically Karl Dönitz, the man who had done so little for Kusch's son, did know. Two days after Kusch's execution, a German *Schnellboot* was attacked and sunk in the English Channel. Among the dead who later washed ashore on the coast of France was Oberleutnant zur see Klaus Dönitz, who had been on board as a guest of the captain."[1]

Dick Boyle

WWII SUBMARINE BASE AT RODMAN, PANAMA

October 10, 1998

I am the Commanding Officer of the Military Sealift Command Office in Panama, and an 1120 Lieutenant. We are located at USNAVSTA Panama Canal, at Rodman, at the Pacific end of the Canal.

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[1]Jordan Vause, Wolf. Annapolis: Naval Institute Press, 1997, pp. 188-191.

As you may know, the U.S. will turn over the Panama Canal and all DOD bases in the former Canal Zone to the government of Panama on 31 December 1999.

What you may not know is that Rodman, Panama was a huge and strategically important submarine base during WWII. Honestly, I do not have all the info as to why Rodman was such an important sub base, but I suspect the following reasons:

1. Protect the canal from either Japanese or German attempts to sink a ship in the Canal and blocking the E-W supply route.
2. Protection of convoys heading from East Coast U.S. to the South Pacific via the Canal.
3. A convenient supply base due to the huge tank farm at Arrijan up the hill from Rodman. This tank farm supplied all convoy ships. Each tank is buried so that it can take a direct hit from a 1000 pound bomb. Not surprisingly, the fine engineering and construction has allowed the tank farm to continue full operations today and for the foreseeable future.

The story of Rodman, the WWII submarine base may be of interest to your readers. Unfortunately, my resources (mainly of time) are too limited to write a good story. However, if you have contact with a submarine historian, I would love to co-author an article. I could contribute local research and interviews.

Please let me know if you have any contacts/interest in this story.

On a separate issue, there are some submarine historical artifacts around here. Primarily, all the streets at Rodman are named after famous WWII subs: HARDER, WAHOO, SEAWOLF TANG—the list goes on. If the Naval Historical Society doesn't take all of the street signs, an appropriate Submarine History Society, like the NAUTILUS Museum in Connecticut or the museums in Keyport, Washington or Hawaii should take them. There is probably other stuff too, that I just don't know about.

Please feel free to give me a call or e-mail me at any time

Lieutenant Charlie Maher, USN
CO, MSCO Panama
Unit 6111
FPO AA 34061
e-mail: CO.MSCO.Panama@smtpgw.misc.navy.mil

MEETING THE SUBMARINE CHALLENGE: A SHORT HISTORY OF THE NAVAL UNDERWATER SYSTEMS CENTER

by John Merrill and Lionel D. Wyld
U.S. Government Printing Office
Washington, DC, 1997

Reviewed by Richard B. Thompson

As is well known to most readers of **THE SUBMARINE REVIEW**, the Naval Underwater Systems Center (now part of the Naval Undersea Warfare Center, headquartered at Newport) was the origin of much of the important submarine technology developed during the Cold War. Formed from the Navy Torpedo Station founded in 1869 at Newport, and the Navy Underwater Sound Laboratory established at New London, NUSC was clearly a jewel in the Navy's RDT&E crown during those years. Working under essential restrictions, John Merrill and Lionel D. Wyld have crafted a fascinating history, but ultimately a disappointing one.

The book begins with some of the early history of Navy activity in this area, but the bulk of the narrative has to do with the developmental history of Cold War submarine systems. Thus, major space is devoted to developments in sonar; combat systems; weapon systems and launchers; optical communications and ESM systems; warfare analyses; and range and test facilities. There are scores of photographs, most collected here for the first time. There is a glossary of terms and acronyms, a usable index, and a modest bibliography at the end of each chapter.

It should be noted that the authors are laboring under three burdens. First, much of the technical history of these developments is classified and (notwithstanding the chuckleheaded inclination to declassification in the present Administration) should properly remain so for several years to come. As a result, there is little technical detail here, not only of the devices and systems themselves, but also of the thinking behind them. Thus the competitive *shoot out* nearly 30 years ago of the Westinghouse turbine-powered version of the Mark 48 and the Gould piston-engined version is briefly described, but there is no discussion of

the engines themselves, or the technical issues involved in generating several hundred horsepower with a small motor. For someone interested in the details, this teasing is extremely frustrating. One will simply have to be patient in awaiting the sort of informed discussion found in Norman Friedman's design histories. The second burden is that this is evidently an official history, certainly authorized by the Navy and produced with official help and blessing. Official history has the virtue that the product is thorough, and as a result the names of many persons who played important parts in these developments appear in the book. These engineers, scientists, and naval officers are truly unsung heroes of the Cold War, and the book plays an important role in recognizing their passion and drama of the work as well. The contrast with the histories of Code 1500 and Naval Reactors (*Nuclear Navy 1946-1962* by R.G. Hewlett and F. Duncan, and *Rickover and the Nuclear Navy: The Discipline of Technology* by F. Duncan) with their discussions of Navy politics and personalities, is striking. Moreover, it is very much a NUSC-eye view of developments in these fields, with a natural tendency to focus on NUSC's achievements as opposed to other Navy and contractor activities. The final burden with which the authors have had to contend is the minimal amount of source material available. I feel the authors have done a splendid job in pulling together this story in the virtual absence of such material in any organized form.

For this reviewer, the best parts of the book were the descriptions and photographs of the test facilities and ranges. Considering the technical difficulties in accurately tracking submarines, torpedoes, and other objects in three dimensions over many miles, the AUTEC range is a remarkable facility. Again, technical details would have been welcome. Similarly, the torpedo ejection test facilities depicted in the book are fascinating, and lead one to appreciate the engineering problem in launching a torpedo at depth and speed, while emitting a minimum of noise. The reviewer is left wondering how many such unique facilities have been closed or abandoned throughout the Navy by *downsizing*.

Ultimately, while this book remains a valuable contribution and an essential starting point for historians of the future, it is only a starting point. The technical histories of these submarine developments remain to be written.■

THE SAFEGUARD OF THE SEA
A Naval History of Britain
660 - 1649

by N.A.M. Rodger
W. W. Norton & Company, Inc.
New York, NY, 1998
Many maps and illustrations
Five Appendices, a Glossary,
Reference List, Bibliography,
and Index
ISBN 0-393-04759-X

Reviewed by CAPT Len Stoehr, USN(Ret.)

Before the Royal Navy, there was Queen Elizabeth's Navy Royale. Before the current professionalism of RN officers, there were many privateers operating under letters of marque and letters of reprisal, and before these, there were the Angle, Saxon and Jute pirates whose descendants settled in England around the fifth century. This volume, the first of a projected four, deals with the first millennium, while the future volumes will address themselves to the remaining three and a half centuries bringing us up to the present. This might seem like a very heavy load on the after deck, but the reading of this narrative illuminates how little is really known about this early period. Not only do we moderns know and understand little, but the series of similar miscalculations that occurred during the period show that the main actors on this stage had little history from which to learn.

Many of the happenings during the dark ages and the medieval years are shrouded in clouds of undocumented legend, and the five hundred years following the Norman Conquest of 1066 which make up the rest of this book show that the English peoples and their leaders learned slowly—"and then for long periods forgot"—about "the use of the sea for national defense, and the defense of those who used the sea." As a means of imposing some order on this process, the author has divided his narrative into four layers:

- Policy, strategy, and naval operations
- Finance, administration, and logistics
- Social history, and
- Material elements (ships and weapons)

This division helps to make a complex story more accessible, but

it also results in a lot of redundancy as the author needs to place each of these developmental lines in a general context with the others. For a book that has over seven hundred pages between its covers, there are only 434 pages of actual narrative and the content of many of these is repetitious. The problems of "victualing," for example, affect the length of time a ship can stay at sea, the cost of operations, the quality of life, and the design of stowage spaces. They therefore appear in all four of the author's layers. I don't have an answer to this problem, but, as I proceeded through the book, there were many times when I felt a boring sense of deja vu. Nevertheless, there is much information here that is enthralling, from the seakeeping characteristics of Viking longboats to the development of naval guns and gunnery.

Mr. Rodger starts his history in the mid-seventh century. At this time the roots of the future in the British Isles could be seen in the interactions of three ethnic/social groups, each of which was associated with, and influenced by, a sea:

- The Irish Sea was "the highway and forum of the Celtic world," connecting the Irish Celts with their kinsmen on the west coasts of Scotland and England. These peoples had become largely Christian from their earlier contacts with Rome.
- The English Channel, the "Narrow Sea," connected the English with the Germanic/Frankish cultures and the Christianity of the late Roman world.
- The North Sea connected a pagan, unromanized Scandinavian culture with its homelands in north Germany and Denmark.

These three worlds met in the British Isles, particularly in England, where they clashed and mingled to form the foundations of the modern society. It is difficult to assimilate how far back we are going here. The first recorded Viking raid on England occurred in 789, "when three Norwegian ships landed at Portland, killing the local official who took them for peaceful merchants." King Alfred, sometimes said to be the father of the fictional King Arthur, ascended to the throne of Wessex in 871—over two centuries beyond the period where Rodger begins his story. In those days there was no naval warfare. Ships were mainly used to move fighting men along the coast. They did not fight each other on the open seas.

Perhaps the best known naval battle during these thousand years was the defeat of the Spanish Armada. My memories of the history

poured into my gullible brain during high school and college are much different from the facts as reported by this author. Rather than an overwhelming force of invading warships defeated by a greatly outnumbered force of gallant English who were given to throwing their cloaks over muddy puddles so that their queen would not get her feet wet, in pure numbers the two sides were rather evenly matched. The Spanish left their ports with a grand total of 141 ships, most of which were troop transports. (The Spanish commander, the Duke of Medina Sidonia, was an experienced sea officer and apparently had few illusions concerning his chances for success.) The English, while their numbers varied considerably over the approximately twelve days of operations, had, at one point, a maximum of 140 ships present. All in all, a total of 197 English ships participated in these operations. The Spanish ships were manned by 7,667 seamen and carried 20,459 soldiers. The troops were, in fact, the only factor in which the Spanish forces at sea were greatly superior. They were not much help in the intermittent skirmishing that took place.

Beside the lack of equality in the number of fighting ships, the English ships were larger and faster. In the matter of armaments, the English guns were generally heavier and the "English rates of fire were of the order of one or one and a half rounds an hour per gun; Spanish about the same *per day.*" With this disparity in weapons and gunnery, the English gunners were soon taking a heavy toll while the Spanish were able to inflict only negligible damage in return. The Armada was gradually chased from the English Channel, through the Straits of Dover, and into the North Sea. The English turned back at about the latitude of the Firth of Forth. The Spaniards sailed north of Scotland, and returned to Spain via a track that took them west of Ireland. Only sixty-seven ships returned to Spain. The year of "1588 was seen as the moment when the tide of Spanish expansion began to turn."

The author concludes that the foundations of British sea power had been laid during these final days of the Tudor dynasty. The shore-based infrastructure was in place and, more importantly, the governing classes had learned the high cost of modern war and the still higher cost of not maintaining an effective navy. This combination led to a consensus for the sustenance of a permanent fighting fleet. The invincible Royal Navy that nobly supported the growth of the British Empire during the next three centuries waited just around a near-future corner.■

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Active Duty, students, and naval Reserve Active Status (Drilling)

- ☐ 1 year $15.00
- ☐ 3 year $41.00

Life Membership Rates: (ALL)

- ☐ 34 years and under $585.00
- ☐ 35-50 years old $475.00
- ☐ 51-65 years old $320.00
- ☐ 66 years and older $175.00

NAVAL SUBMARINE LEAGUE

Corporate Membership

1 - 50 employees	$ 400.00
51 - 100 employees	$ 800.00
100 - 500 employees	$1,200.00
over 500 employees	$1,600.00

Donor/Corporate Contribution

(in addition to dues)

- ☐ Patron $1,000.00
- ☐ Sponsor $ 500.00
- ☐ Skipper $ 100.00
- ☐ Advisor $ 50.00
- ☐ Associate $_____

Persons residing outside the U.S. please remit an additional $15.00 per year for mailing costs

The Naval Submarine League is a tax-exempt, Virginia not for profit corporation.
Two-thirds of Memberships Dues and 100% of donations are tax deductible

MEMBERSHIP APPLICATION

NAVAL SUBMARINE LEAGUE
P.O. Box 1146
Annandale, VA 22003
(703) 256-0891

Date _____

VISA/MasterCard # _____

Exp. Date _____ Signature _____

E-mail _____

I hereby apply for membership in THE NAVAL SUBMARINE LEAGUE. I certify that I am a citizen of the United States or a citizen of _____

Name _____
Rank, Service, if applicable

Address _____

_____

Phone (Business) _____ (Home) _____

Employer and Address _____

_____

_____

Position/Title _____

I was introduced to the Naval Submarine League by _____

ENCLOSED MONIES

☐ _____ Membership Dues

☐ _____ Donation
See Reverse Side for Rates

Your membership will bring you ....

- The Submarine Review
- Avenue to keep current on submarine issues
- Ability to contribute to public awareness of submarine capabilities
- Association with a dedicated group of people
- Invitation to Annual Meeting
- Forum for Exchange of thought on submarine matters


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NAVAL SUBMARINE LEAGUE
P. O. Box 1146
Annandale, Virginia 22003