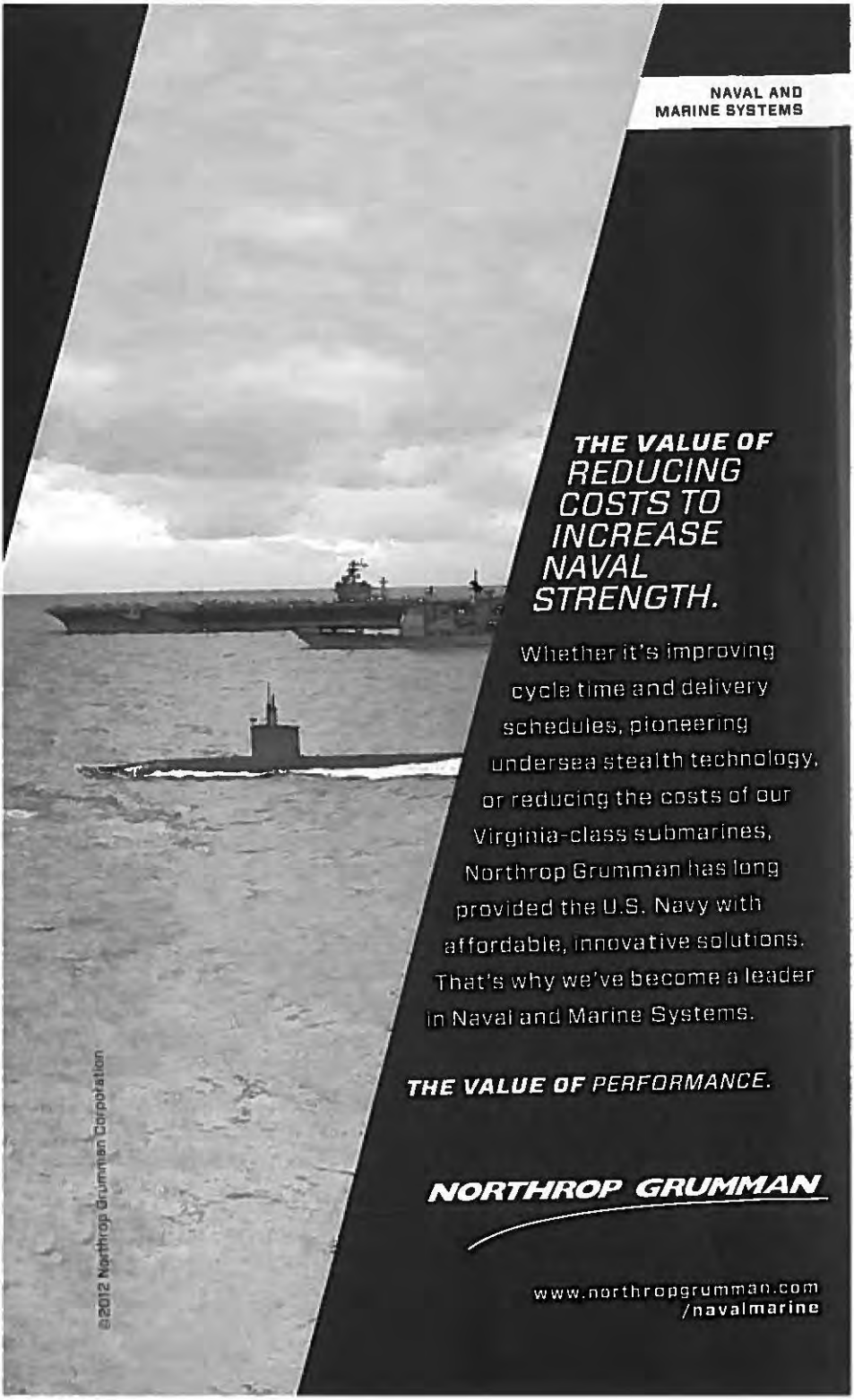
FALL 2011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EDITOR'S COMMENTS

This Fall 2011 issue is both a bit unusual and very important. The unusual factor is also the least important; it is the Fall 2011 issue and not the October 2011 issue. The change from specific monthly designations to a more general seasonal system is to provide a bit more flexibility in getting the issue to our readers as we go down the path toward some on-line delivery. It also allows for the sometimes lengthy processing of important policy statements. As the submarine community faces a future with both significant force structure issues and a tough national fiscal situation, we feel it is important that our magazine focuses on the news we all need, and provides for any flexibility required in bringing that news to our members and other interested readers.

The really important factor is that two of our community's, and our nation's, most experienced senior officers took the opportunity presented by the League's Annual Symposium to comment on complex *Risk Management* matters of vital interest to our country, and those presentations are published in this issue. As a technologically competent community it falls to all of us to ensure their concerns are given wide distribution. In each case those concerns for our national safety and well-being are expressed in terms understandable by the general public: readers of these pages are encouraged to use these two important messages in their dealings within their companies, community organizations and where ever else they may find the opportunity.

Admiral Rich Mies spoke of the problems within our Strategic Forces, the underpinnings of that entire group of forces and the management of what he termed as "the Strategic Force Enterprise". Admiral Mies also addressed the often less-than-well understood concept of *Disarmament* as it is applied to Nuclear Weapon Forces. He distinctly separated *Disarmament* from *Reductions for Stability* and laid out the fallacies between the two. It is not always possible to find Nuclear Weapons matters discussed in objective, knowledgeable terms; especially from an experienced and recognized authority. This is a unique opportunity

for readers of THE SUBMARINE REVIEW to use this material to participate in the National Debate to come.

Admiral Kirk Donald addressed his commentary on *Risk Management* to the reduction in risk in technologically advanced enterprises. He spoke specifically of three disasters and the circumstances of each. He included THRESHER in those accounts, as well as the Japanese reactor plant accidents and the Gulf of Mexico oil spill. He stressed the use of vital standards in the evaluation of risks inherent in complex operations and used the three cited incidents as examples of incomplete and inadequate risk reduction practices. It is obvious from the presentations by both ADM Mies and ADM Donald that all sections of our submarine community, designers, builders, operators and even the greybeard mentors have to be knowledgeable of, and scrupulous in, the practice of *risk management and reduction.*

The Hon. Frank Miller was the Symposium Banquet Speaker and he also spoke about the US Nuclear Posture and strongly endorsed the OHIO Class Replacement Program as a vital centerpiece of US 21st Century national security. His long experience in national security policy and his standing as a respected advisor to many at the policy level of government give great weight to that endorsement. His Banquet Speech is also published here for the widest possible dissemination.

Both VADM Richardson, Commander Submarine Forces and CEO of the Undersea Warfare Enterprise, and RADM Caldwell, Commander, Submarine Force Pacific Fleet and COO of the Undersea Warfare Enterprise presented the direction for the future and the current status of the Submarine Force. Both of those presentations are published here.

Naturally we also have other interesting contributions as Articles and as Letters. Two of those are of particular interest: Dr. Kalbergs piece on submarines in the current economic situation and Mr. Zimmerman,s 1963 piece on submarine employment in a major WW II sea battle. That would seem to be the first instance of actual submarine combat in a Fleet Engagement.

Jim Hay, Editor

FROM THE PRESIDENT

The U.S. Submarine Force had a very good year! During this period, our Submarine Force performed with distinction and met key challenges and milestones. The commissioning of USS CALIFORNIA (SSN 781) in October will be followed by USS MISSISSIPPI (SSN 782) next year. The proposed 2012 DoD budget has funding authorized for two VIRGINIA Class Submarines.

The Naval Submarine League also completed a successful summer with the election of new two new Directors, VADM Jay Donnelly and Mr. Jack Gellen, to their first terms, and the reelection of RADM Dave Gove to his first full four-year term. Dr. Ed Liszka, VADM Stan Szemborski and CAPT Tom Vecchiolla were reelected to second four-year terms. Mr. Matt Mulherin was appointed to a one-year term to replace Mr. Mike Petters who has resigned. VADM George Emery and ADM Rich Mies were appointed to one year terms to serve as STS Chairman and Chairman respectively. RADM Barry Bruner, USN, Director, Submarine Warfare (N87) and FORCM (SS) Cash Caldwell, COMSUBPAC Force Master Chief were appointed as liaison members of the board. The Fiscal Year 2011 Annual Report was mailed with the Symposium invitations and is also on the League's webpage. The summary audit report is in this issue of the Review.

Over the past several months, I traveled to seven chapters reporting on the progress the Submarine Force is making in *"The Way Ahead"* announced in February. The slides for this presentation are on the League's website. VADM Richardson's *"Design for Undersea Warfare"* is published in this edition of the Review. These two documents discuss the focus that the Submarine Force has placed on providing mission ready submarines to the combatant commanders and the means of maintaining a ready force by modernizing and building new submarines. I urge you to familiarize yourselves with these documents and be prepared to present the salient facts needed to defend the acquisition of two submarines per year and the building of the OHIO Replacement Program submarine.

The League provided the opportunity for the Submarine Force leadership to present their approach to fulfilling their *Design for Undersea Warfare* at the annual symposium held on 19-20 October. ADM Rich Mies, our Chairman, kicked off the symposium with an analysis of the continued focus on the importance of acquiring and modernizing our strategic arsenal. In particular, he noted that while many words have been spoken and written about the strategic arsenal, very little effort has been directed to funding these programs and sustaining the nation's nuclear capabilities. The current budget discussion and anticipated reductions in defense spending place this vital capability at risk and I urge you to read ADM Mies' presentation in this issue.

ADM Kirk Donald provided an outstanding overview of the importance of strict procedures and rigorous assessment to preclude severe consequences of an unanticipated incident. Within the context of the Japanese Fukushima reactor accidents, the Deepwater Horizon drilling rig catastrophe, and the loss of USS THRESHER (SSN 593), he discussed some of the lessons from three unique and tragic events to remind all of us how our Submarine Force's fundamental principles keep us successful. This speech is also in this issue.

The highlights of the symposium included a luncheon honoring the 2010 Fleet Awardees and a banquet honoring Dr. Robert M. Snuggs as the Distinguished Civilian and Admiral Kinnaird McKee, USN (Ret) as the Distinguished Submariner. In addition to a distinguished group of speakers representing the officer and enlisted Submarine Force leadership from the operational, acquisition, resource sponsor, and technical communities, Master Chief Petty Officer of the Navy Rick West and the Honorable Frank Miller, a past Distinguished Civilian selectee, were our luncheon and banquet speakers respectively.

We have another outstanding series of events scheduled for 2012. I encourage you to put all of the below event dates on your calendar and participate in as many as you are able.

- Corporate Benefactor Days is scheduled for 1-2 February 2012 (by invitation only). Corporate Benefactors continue to be the strong foundation of League support. Seventy-four corporations actively support League initiatives and activities.

- The Submarine History Seminar is planned for early April 2012 at the National War College. RADM Jerry Holland continues to bring fascinating and distinctive submarine history programs to this event.
- Preparations are underway for the 2012 classified Submarine Technology Symposium (STS) which will be held at The Johns Hopkins University Applied Physics Laboratory on 15-17 May 2012. The theme is ***"Maximizing Capability- Technologies to Enhance Submarine Effectiveness and Availability."*** VADM George Emery has identified all the session chairs, the plenary speakers and the papers to be presented. Additional information about STS is on the NSL webpage: www.navalsubleage.com.
- The 2012 Annual Symposium and Submarine Fall Cocktail Party will be held 17-18 October 2012 at the Fairview Park Marriott, a new venue.

I welcome your comments and suggestions on what the League can do to better fulfill its mission of educating the public on the importance of submarines to our national defense, and I urge you to submit your ideas in the form of an article for ***The Submarine Review***. League members are uniquely qualified to contribute papers in support of the Submarine Force. The ***Review*** is widely read outside the Submarine Force by Congressional members and staff and Defense Department leadership. A subset of this edition is being mailed to all members of congress, selected state legislatures and members of the Submarine Base Industrial Council.

Finally, I hope you all had a wonderful Holiday Season and ask you to continue to pray for the safety of our troops deployed all over the world. I am privileged to represent you in the leadership of the League and encourage you to recommend membership to your shipmates and friends.

John B. Padgett III
President

USS GEORGE H.W. BUSH (CVN 77)

USCGC BERTHOLF (WMSL 750)

USS WILLIAM P. LAWRENCE (DDG 110)

USS MAKIN ISLAND (LHD 8)

USS NEW YORK (LPD 21)

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ANNUAL SYMPOSIUM

MANAGING RISKS AND UNCERTAINTIES IN A NEW STRATEGIC AGE

by Admiral Richard W. Mies, USN(Ret)

Admiral Mies is Chairman of the Board of Directors for The Naval Submarine League. On active duty he served as Commander, Submarine Forces and as Commander, US Strategic Command.

Welcome to the 29th annual Naval Submarine League Symposium. As I indicated at the last Technology Symposium our Submarine Force faces a challenge similar to the ones we faced at the start of World War II and the Cold War—a period of great uncertainty. This time we face an extremely adverse fiscal climate and a corrosive political environment in the midst of an impending Presidential election. The perfect storm. As a Nation we are sailing into uncharted waters; and as a Submarine Force we will be challenged like our forebears in WWII and the Cold War. But as a great poet once said, "A man can see farther through a tear than a telescope." Adversity is a great teacher. Calm seas do not make a skillful sailor.

I'd like to focus today on the role of nuclear weapons in our national security and the importance of the OHIO Replacement Program in sustainment of our SSBN Force—the preeminent leg of our strategic deterrent.

As the title of my presentation indicates, I intend to talk broadly about managing strategic force risks and uncertainties in a new strategic age.

Let me unequivocally state at the onset that none of my following discussion on risks and uncertainties is intended to discourage reductions in our nuclear arsenal **that promote greater stability**, but to recognize that the journey is far more important than the destination and that the **overriding goal is not reductions**

for disarmament's sake but increased international stability and, most importantly, the avoidance of war.

The Defense Science Board 2007 Summer Study Report delineates in detail many elements of this new strategic age. I encourage you to go to the DSB website and read that report. To summarize some of the report's key findings:

We live in an uncertain world where:

- the character of warfare is changing
- we face great risks involving the proliferation of:
  - weapons of mass destruction
  - their means of delivery
  - hard and deeply buried targets that are relatively immune to our conventional superiority
- There is an increase in the fluidity and unpredictability of the international security environment driven largely by the emergence of a wider range of more diverse threats including non-state actors and potential near peer competitors who can challenge us in asymmetric ways.

Deterrence—the act or means of preventing someone from acting out of doubt or fear that the action will provoke a response with disadvantages that outweigh the advantage—is an enduring strategic concept, but one that needs to be constantly rethought and adapted to fit changing contexts and circumstances. During the Cold War strategic deterrence was primarily bi-polar in character; today it is far more complex in this multi-polar world we find ourselves in.

Nonetheless, its primary purpose remains to influence potential adversaries' intentions far more than their capabilities through two interrelated means—the power to hurt and the power to deny. These powers are most successful when held in reserve and their non-use, their potential, exploited through diplomacy. The most successful threats are the ones that never have to be carried out.

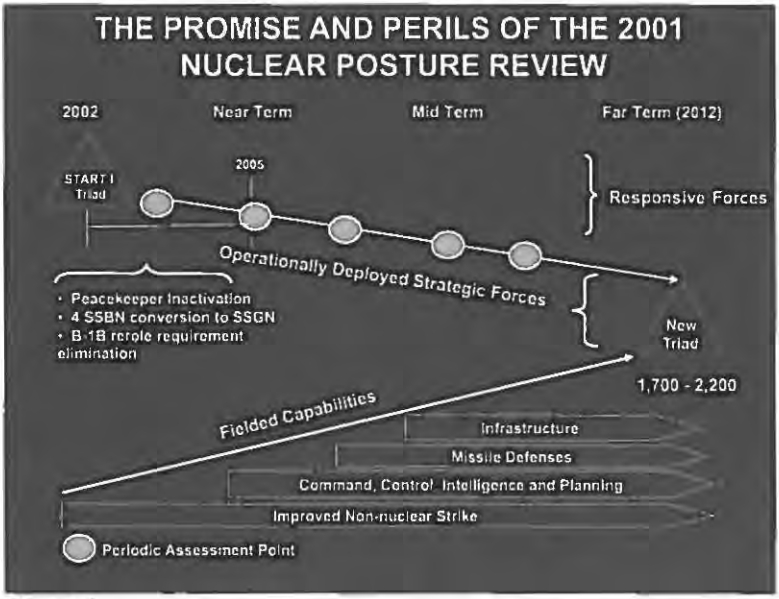

Figure 1

Figure 1 is intended to illustrate the journey of our strategic forces and doctrine that was charted in the 2001 Nuclear Posture Review. I emphasize that this is about a journey rather than a destination because the marker shown in 2012 is just a milepost. A journey we began out of recognition that U.S. nuclear doctrine and forces needed to have lower salience and a less adversarial character; most directly as a result of our changed relationship with Russia; and also out of recognition that deterrence was likely to be more complex and perhaps less reliable, particularly against non-state actors, **although not necessarily less relevant**. And while we have made great progress in the drawdown of our strategic forces, progress to field new capabilities (on the bottom of the figure) to achieve the vision of a New Triad has been inadequate to meet our national security needs, particularly in the areas of:

- building a robust strategic infrastructure
- enhancing strategic command and control, intelligence, and planning

- recruiting and retaining well-qualified and talented people

In many cases, well documented in a number of reports in the past decade, most recently in Admiral Chiles' DSB Report on nuclear expertise and skills, the Schlesinger Task Force Reports, and the Nuclear Comprehensive Review that I chaired, we have experienced significant erosion in our strategic deterrent capabilities. In spite of the rhetoric of the past two Nuclear Posture Reviews and the National Defense Strategy, there has been a paucity of senior-level Administration thinking on the role of our strategic deterrent, and particularly the role of nuclear weapons in the 21st century. There are many reasons given for this (e.g., the Global War on Terror, operations in Afghanistan and Iraq, the unchallenged US conventional superiority, etc.). Nevertheless, the result is a glaring mismatch between the rhetoric of national strategy and the resources committed to our national strategy objectives. The failure to engage Congress in a meaningful debate and build a national consensus on the role of our strategic forces has resulted in an atrophy of our strategic capabilities. This atrophy should not come as a great surprise. As I stated earlier, it has been well documented in numerous reports over the past decade. There is little new in the Schlesinger Task Force reports, The Chiles Defense Science Board report, or the Nuclear Comprehensive Review. This erosion manifests itself across the entire strategic enterprise, although in recent days, I believe actions have been taken to arrest some of this erosion. In general, we seem paralyzed by inaction and a lack of consensus. Our nuclear forces are frozen in time—aging and of declining reliability. As I discuss in greater detail later, this atrophy and diminution of our capabilities may call into question our ability to credibly deter, to extend that deterrence to allies and friends, and to prevail in the event of conflict. It might embolden others to challenge us.

In general, the fundamental underlying cause has been a lack of senior leadership attention—both civilian and military across

Administrations—to nuclear weapon issues. This lack of senior leadership attention has resulted in public confusion, Congressional distrust, and a serious erosion of advocacy, expertise, and proficiency in our nuclear forces.

It is appropriate to focus on the risks associated with further strategic force reductions beyond those of the New START Treaty. As we contemplate reductions in our nuclear forces to lower levels consistent with our national security needs, at some lower levels, we will inevitably encounter several risks related to our national security strategy of assurance, dissuasion, and deterrence:

- First, the credibility of our extended nuclear deterrent may fall into serious question by some of our allies. Instead of promoting non-proliferation, our reductions may have the perverse, opposite effect. This relates to what some refer to as the 5 and 95 percent paradox. While a small amount of uncertainty (e.g. 5 percent) as to whether the US may or may not employ nuclear weapons is likely to deter potential adversaries from conflict or aggression, our allies demand a much higher level of assurance (e.g. 95 percent) in the credibility of our extended deterrence commitments.
- Second, below certain levels, potential adversaries may be encouraged to challenge us. A smaller arsenal may appear to be a more tempting and easier target for preemption or breakout or a race to parity.
- Third, at some level it will become more difficult and economically impractical to sustain the present strategic triad. While there is nothing sacrosanct about the triad, numerous analyses and studies have repeatedly reaffirmed the wisdom of preserving the complementary capabilities of the strategic triad of land-based intercontinental ballistic missiles (ICBM), submarine launched ballistic missiles (SLBM), and strategic bombers. Each leg of the triad contributes unique attributes that enhance deterrence and reduce risk such

that the whole is greater than the sum of the parts. ICBMs provide a prompt response, the potential to launch under attack, and a hardened, geographically-dispersed target base. Additionally, single warhead ICBMs are considered stabilizing since they are less attractive than MIRVed ICBMs as targets and the ratio of weapons required to destroy them is greater than one. Missile submarines provide survivable, assured response and the mobility to adapt missile overflight to targets. Strategic bombers provide great flexibility in force posturing, signaling intentions, route planning, and recall-ability. Together they comprise a robust deterrent capability that complicates a potential adversary's offensive and defensive planning and a synergistic force that provides protection against the failure of a single leg.

In every STRATCOM force structure analysis I've been involved with over the years, there were two general truths:

- For the same force levels, a triad performs better than a dyad, and a dyad performs better than a monad. Diversity affords a hedge against single point failures and significantly complicates a potential adversary's offensive and defensive planning considerations.
- There is a tyranny in low platform numbers that greatly restricts the flexibility, survivability and resiliency of the force. Fewer eggs in more baskets fares far better than too many eggs in too few baskets.

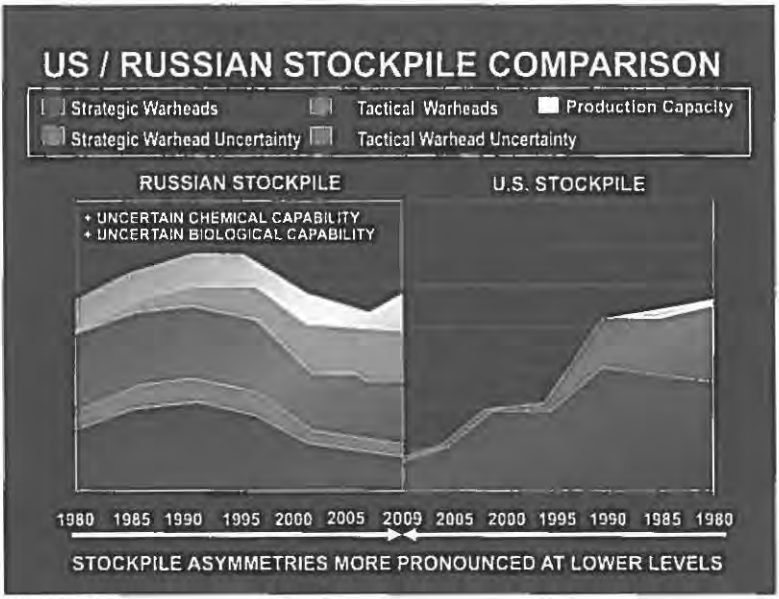

Figure 2

Figure 2 is a relative comparison of the US and Russian nuclear stockpiles over the past three decades starting from the outside and working toward the center.

There are several noteworthy points: As you can see we have dramatically and unilaterally drawn down our tactical nuclear forces in contrast to Russia. To my knowledge, our unilateral disarmament initiatives have done little to promote similar initiatives in our potential adversaries, and at the same time, have reduced our arms control negotiating leverage. In that sense, the lead part of the "lead and hedge" strategy—the idea that if we lead others will follow—has proven to be illusory. Second, and similarly, the promise of a responsive infrastructure remains largely unfulfilled—we have had virtually no warhead production capability for the past two decades and little likelihood of developing one within the coming decade. Finally, because of the difficulties and our lack of leverage in expanding arms control initiatives to include these elements (tactical or non-strategic

nuclear forces and production capability), if we jointly agree to reduce our strategic nuclear forces to even lower levels, the asymmetries in our stockpiles will become more and more pronounced. In a subsequent figure I'll also address what I believe to be an artificial and inappropriate distinction between strategic and tactical nuclear weapons.

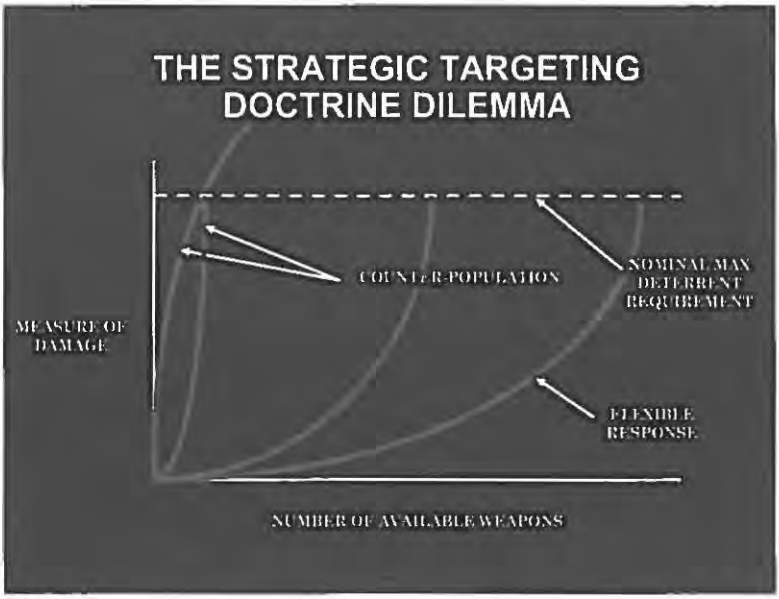

Figure 3

Figure 3 is a notional chart intended to illustrate several of the dilemmas of strategic targeting. The curve on the right represents our present and long-standing targeting doctrine of flexible response—a counter-force doctrine designed to provide the President the widest range of options using **the minimum level of force intended to achieve our objectives**. The curve on the far left illustrates that if we adopted a counter-value or counter-population targeting strategy we could achieve significantly more damage with fewer weapons.

As we reduce the number of available weapons, that flexible response curve moves to the left and the robustness and flexibility inherent in a moderately sized arsenal (a few thousand as compared to a few hundred) will be diminished. Stability—the assurance against being caught by surprise, the safety in waiting, the lack of an incentive on either side to initiate major aggression or conflict—will be challenged. Greater stress will be placed on the reliability and survivability of our remaining forces. As I indicated earlier, at some level it will become more difficult and economically impractical to sustain the present strategic triad. And, of greatest concern, the range of flexible response options designed to provide the President **with minimum use of force** will be reduced.

Ultimately, below a certain level, to remain credible our targeting doctrine and policies would have to shift away from flexible response and counter-force targets to counter-population targets (as depicted by the two curves on the left that represent the range of counter population options)—a transition that is counter to our historical practice, politically less tolerable, and morally repugnant. Although I am not an international lawyer, I would also argue that such a transition is in violation of the Law of Armed Conflict and the Theory of Just War.

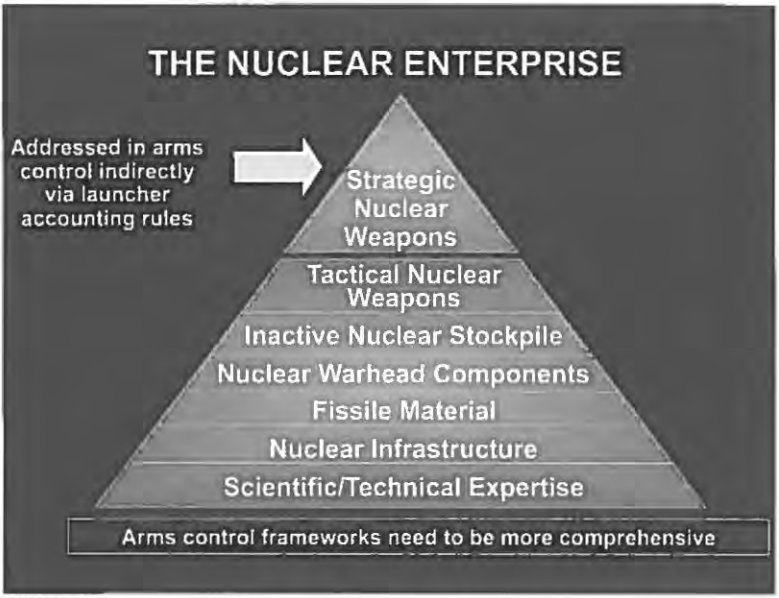

Figure 4

If you think about our strategic capabilities as an enterprise, it really is a pyramid as Figure 4 depicts, whose foundation is the scientific and technological expertise resident in our nuclear complex employees and in our strategic operating forces. That foundation is growing increasingly thin and brittle—through both an aging work force and difficulties recruiting and retaining the best and brightest. And while many have spoken eloquently about the importance of science and technology programs as critical underpinnings of the DOE nuclear enterprise, there are really few, if any, programs analogous to the science-based stockpile stewardship program or the advanced computing initiatives, on the DOD side. We have raised a whole generation of **war-fighters** within DOD who have received virtually no professional education in the theories of assurance, dissuasion and deterrence, and consequently fail to think in **war-prevention** terms. Additionally, there is little, if any, programmatic advocacy within OSD, the Joint Staff, and the Military Services for the strategic nuclear enterprise.

Several points are worthy of mention with respect to this enterprise pyramid. Foremost, deterrence depends on the health of the **entire** pyramid not just any one element. We can't deter with just a strong foundation—a *virtual deterrent* is simply not credible. Second, the distinction between tactical and strategic nuclear weapons is an outmoded, treaty-derived distinction that relates more to delivery platforms than actual warheads. There is little significant difference in the design and capabilities of our tactical and strategic warheads. Any tactical nuclear weapon can be used with strategic effect. Despite these factors, our focus on the enterprise tends to be disproportionately narrow—driven to an over-emphasis on the very top of the pyramid to strategic weapons and even then indirectly—because of our captivation with strategic warhead numbers, limitations in monitoring and verification capabilities, and our failure to view the enterprise in a more comprehensive way.

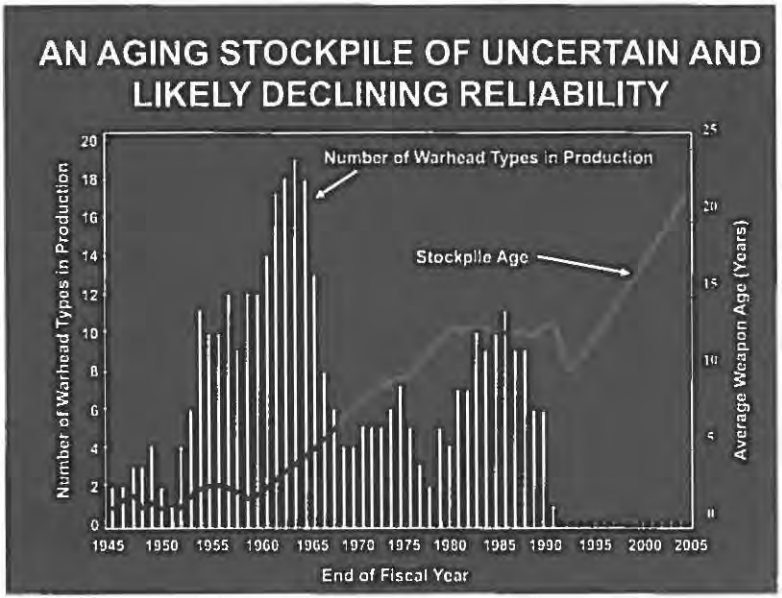

Figure 5

Figure 5 illustrates the aging of our legacy Cold War stockpile and our lack of design and production capability. We have lost people with unique skills as well as design and production knowledge. Many of our warheads are beyond their design lives and lack desirable safety and surety features we are now capable of incorporating into replacement designs. Our legacy warheads are sophisticated machines, similar to a 20th century Rolls Royce, with as many as 6000 intricate parts and complex chemical interactions. Because of their sophistication, some warhead performance margins are extremely narrow. And unlike wine, the reliability of sophisticated machines doesn't improve with age. The best we can do is to extend their lives. Needless to say, reestablishing design and production capabilities remains a very complex and lengthy process.

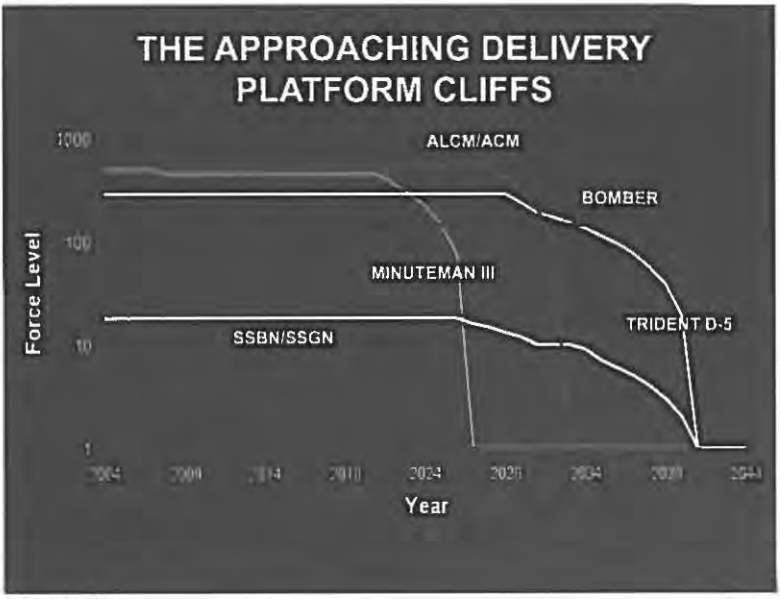

Figure 6

Figure 6 complements the previous one. Not only is our warhead stockpile aging, all of our strategic delivery systems are

approaching end-of-life. Contrast this with other key nuclear-capable nations who are modernizing substantially their strategic forces. Hence, we must not be hasty in taking irreversible steps that reduce our capabilities or flexibility.

Credible deterrence ultimately depends not on our ability to strike first, but on the assurance we always have the capability to strike second. So the number of survivable strategic submarines at sea remains critical.

And credible deterrence is both a function of our capabilities and will **as perceived by our potential adversaries**. The great paradox of nuclear weapons is that they deter conflict by the possibility of their use, and the more a potential adversary perceives the credibility of our capabilities and will, the less likely he is to challenge their use. The converse of that proposition is also true. To be credible, capabilities and plans have been developed since the early 1960s to provide the President with as broad a range of options as considered prudent to enable him to respond with the minimum use of force. Hence, based upon figures 5 and 6, at what point do our smaller and aging strategic forces lose credibility?

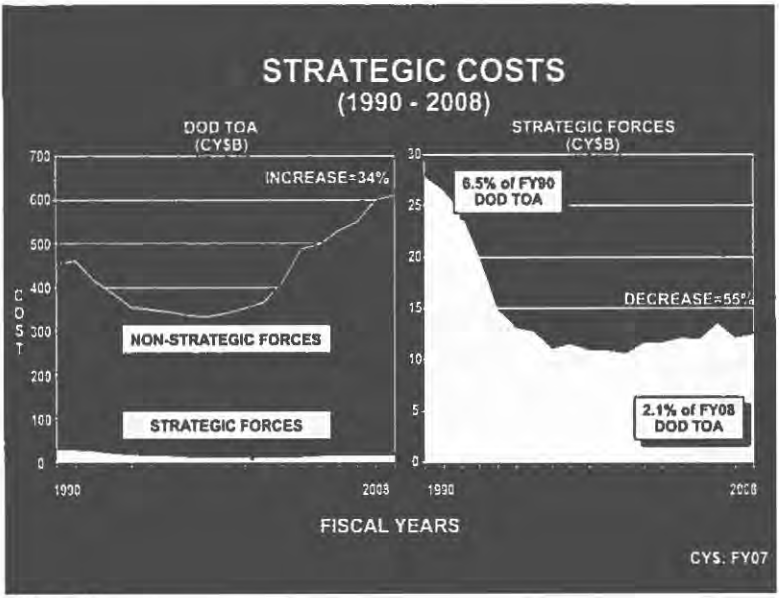

Figure 7

Figure 7 attempts to capture a fiscal comparison of our conventional and nuclear forces. There is a common misperception that nuclear forces are a "cash cow"—expensive relative to conventional forces—and that further reductions will free significant resources for alternative uses. As the graph on the left of Figure 7 illustrates, in reality, nuclear forces are very cost-effective relative to conventional forces and historically have consumed less than 5% of the DOD budget (including dual-capable forces like bombers). Most of this cost is driven by overhead and infrastructure such that warhead reductions will not result in any meaningful savings. The graph on the right of Figure 7 is an expanded view of the nuclear force costs in the left graph. Considering their role in war prevention, I believe you should think of our nuclear forces much like you think personally about health and life insurance. Nuclear weapons are cheap not expensive—I believe their cost as a small percentage of the DOD budget is a very reasonable premium for the Nation's "ultimate insurance policy."

Figure 8

As Figure 8 illustrates, there are a significant number of areas where action is sorely needed to improve our strategic capabilities. Here is a **partial** list of those I consider most important. They are self-explanatory. Further inaction and postponement to develop these capabilities is not an acceptable answer and will only make recovery more difficult.

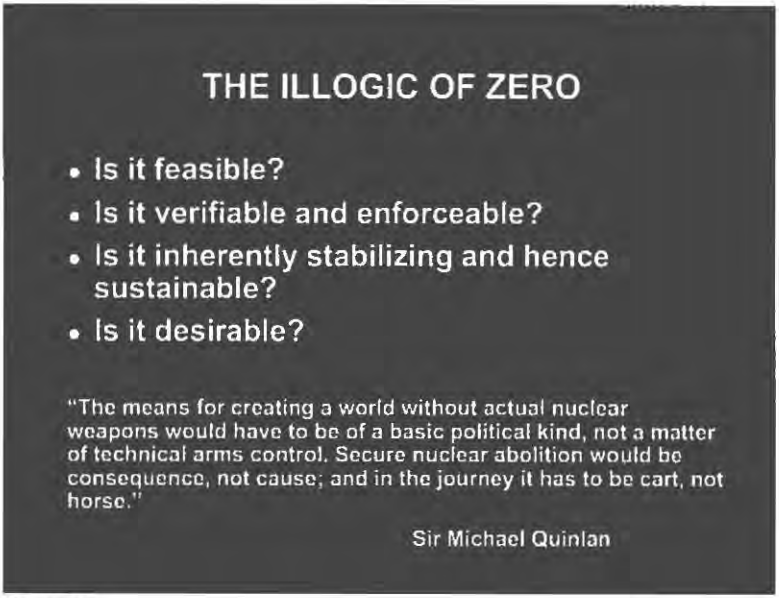

Figure 9

With Figure 9 I'd like to be a little provocative and take a few moments to address the widely publicized initiative to eliminate nuclear weapons. I believe a significant burden of proof rests upon those who advocate this position to answer some fundamental questions about the logic of zero. **Without compelling answers to these questions and achievable actions, I believe this vision will prove counterproductive, promote unrealistic expectations, and serve as justification to keep the strategic enterprise adrift— paralyzed and frozen in time.** The quote at the bottom summarizes my view. Nuclear abolition has to be cart not horse. As an experienced statesman said, "Nations don't distrust each other because they are armed; they are armed because they distrust each other." Instead of focusing on disarmament, we need to focus more on the fundamental, underlying causes of distrust.

So these are four questions for which I don't believe we've received compelling, comprehensive answers from those advocating nuclear abolition:

First. Is it feasible? If so, what detailed, specific actions must be taken by individual nations and the international community and what timeframes are envisioned to accomplish those actions? How do you achieve those reductions and avoid the risks and uncertainties I've already highlighted. I personally cannot foresee the abolition of nuclear weapons in either my or my children's lifetimes.

Second. Is it verifiable and enforceable? If so, by whom and with what means? How would compliance be enforced? Again, I personally do not believe such an intrusive and comprehensive verification regime is achievable in our existing geopolitical framework.

Third. If it is both feasible and verifiable, is it inherently stabilizing and hence sustainable? Since the knowledge to build nuclear weapons cannot be erased and many nations will have latent nuclear capabilities, what disincentives will preclude cheating or breakout? If the threat of biological terrorism remains a major threat despite the abolition of biological weapons, why do proponents believe that abolition of nuclear weapons will significantly reduce the threat of nuclear terrorism? I personally question what means will exist to prevent a terrorist from acquiring fissile material which will still be in abundant supply. And what means will exist to prevent a rogue nation from aspiring to become a nuclear superpower in a non-nuclear world? As a former professor of mine, Tom Schelling has written, under abolition, present nuclear powers would actually be latent nuclear powers — hardly "former nuclear powers." And if the bomb could be invented from scratch during World War II, imagine how quickly the nuclear genie could be conjured back into action now:

> "In summary, a *world without nuclear weapons* would be a world in which the United States, Russia, Israel, China and half a dozen or a dozen other countries would have hair-trigger mobilization plans to rebuild nuclear weapons and mobilize or commandeer delivery systems, and would have prepared targets to pre-empt other nations' nuclear facilities, all in a high-alert status, with practice drills and secure emergency communications. Every crisis would be a nuclear crisis, any war could become a nuclear war. The

urge to pre-empt would dominate; whoever gets the first few weapons will coerce or pre-empt. It would be a nervous world."

And lastly, if nuclear weapon abolition can be achieved and sustained, is it really desirable? How can we be sure we are not making the world safe for conventional war? And how safe and secure will we be as a nation when at some future inevitable time, we are no longer the world's superpower? To me these are fundamental questions that the abolitionists blithely ignore.

Figure 10

I use Figure 10 to reinforce my last question. As this graph of wartime fatalities as a percentage of world population illustrates, conventional warfare took a devastating toll throughout history before the advent of nuclear weapons.

However, as depicted in Figure 10, since the advent of nuclear weapons at the end of World War II, the transformation of warfare has been dramatic. I would argue that a principal reason for this

transformation is the recognition that nuclear weapons have extended the potential of warfare to a level where classical warfare concepts cease to apply or have meaning. Nuclear weapons are fundamentally different from conventional weaponry: pound for pound, they are several million times more potent and no adequate defense against them is known or foreseen to exist. Regardless of force superiority, conventional weapons are contestable both temporally and geographically; in contrast, nuclear weapons are not contestable. Whereas in the past, nations sought to achieve strategic objectives through war, I would argue that nuclear weapons have created a strong restraining force among nations to avert war. And that has contributed to a remarkable, revolutionary transformation in warfare.

There is a common fallacy about deterrence that holds that nuclear weapons deter only nuclear weapons. To accept that, one has to accept that nuclear weapons have played no role in the remarkable peace among the nuclear powers during the past six decades, despite periods of significant tension and East-West confrontation. While it is impossible to prove a negative, I believe the graph clearly illustrates the role nuclear weapons have played in transforming warfare.

And it would be equally fallacious to assume, that without some fundamental change in the political configuration of the world, nuclear weapons have no relevance for the future. Deterrence is about preventing all major wars, not just nuclear ones, since major war is the most likely road to nuclear war. I seriously question what evidence those advocating disarmament and nuclear abolition can point to that illustrates how disarmament has made the world more peaceful.

THE ABOLITION CART BEFORE THE GEOPOLITICAL HORSE?

"The trouble with disarmament was (it still is) that the problem of war is tackled upside down and at the wrong end. Upside down first; for nations do not arm willingly. Indeed, they are sometimes only too willing to disarm, as the British did to their sorrow in the Baldwin days. Nations don't distrust each other because they are armed; they are armed because they distrust each other. And therefore to want disarmament before a minimum of common agreement on fundamentals is as absurd as to want people to go undressed in winter. Let the weather be warm, and people will discard their clothes readily and without committees to tell them how they are to undress."

Salvador de Madariaga

Figure 11

The quote in Figure 11 is self explanatory. Theories and concepts abound on the political, strategic, and military significance of nuclear weapons but we should be mindful of their limitations. We lack sufficient hard evidence about the consequences of nuclear weapon use. After all, we only have one example of the actual use of nuclear weapons in conflict. In the words of an experienced practitioner:

> "The resulting limitations in our knowledge ought to instill in all who make predictive statements about these issues a degree of humility not always evident... There is no substitute for looking at the merits of what is said than the eminence of who said it... the means for creating a world without actual nuclear weapons would have to be of a basic political kind, not a matter of technical arms control. Secure nuclear abolition would be consequence, not cause; and in the journey it has to be cart, not horse... Better unquestionably, pending political transformation, to have nuclear weapons but not war than to have war but

not nuclear weapons."

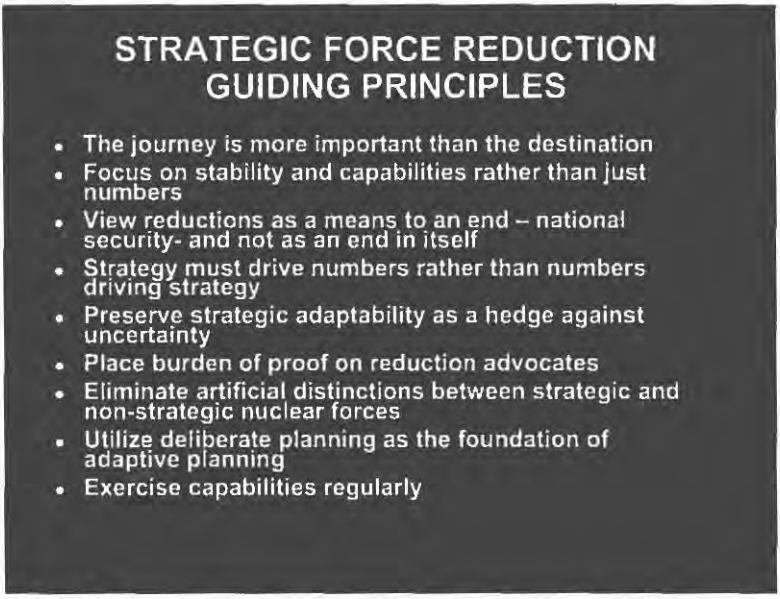

Figure 12

As we continue on this strategic journey, I believe there are a number of fundamental principles that should guide us. I've tried to enumerate many of them here on Figure 12. Most are self-explanatory but allow me expound on a few.

First, we should continue to focus on arms control measures that directly and demonstrably enhance stability and reduce the risks of war. Stability—the lack of an incentive on either side to initiate major aggression or conflict, the assurance against being caught by surprise, the safety in waiting—rather than numerical parity is the most important criterion in assessing force structure and posture options. As Albert Wohlstetter wrote many years ago, "Relaxation of tensions, which everyone thinks is good, is not easily distinguished from relaxing one's guard, which everyone thinks is bad." There is a naïve and mistaken belief that the "nuclear danger" is directly proportional to the number of nuclear

weapons and accordingly, lower is, axiomatically, better. However, disarmament is not inherently stabilizing. One can envision many scenarios where small numbers breed instability. As we reduce our nuclear forces to lower levels, numbers alone become less important. Issues such as survivability, reliability, transparency, accountability, reconstitution, force asymmetries, production infrastructures, and verifiability become more and more important. It is ultimately the character and posture of our forces as well as those of our allies and adversaries, more than just numbers, that makes the strategic environment stable or unstable.

Second, strategy must be the starting point—it should drive numbers rather than the reverse. A number of people have declared with unwarranted certitude that we can successfully reduce our operationally deployed forces to some lower number (e.g. 500 or 1000) without ever formulating or articulating what changes in national strategy, objectives, capabilities, force structure, and force posture would be required. Instead of threat-based or capabilities-based deterrence, underpinned by rigorous analyses, war-gaming, and risk assessment, they seem to be advocating a form of faith-based deterrence. Again, strategy must be the starting point. It should follow a logic path similar to the following:

- Whom do we want to deter and under what circumstances might we need to simultaneously deter more than one potential adversary?
- What do those potential adversaries hold that they value most?
- What kinds of capabilities do we need to hold what they value at risk under the most stressful of scenarios?
- What kinds of capabilities do we need to meet our extended deterrence commitments to our allies and friends?
- How do we hedge those capabilities against technological surprise and imperfect intelligence?
- What form of strategic reserve, supporting infrastructure, and reconstitution capabilities are required to maintain those capabilities?

- How do we posture those capabilities to promote stability—to discourage any potential adversary from preemption, to avoid a "use them or lose them" situation, and to ensure we always have the capability to strike second?
- And finally, what numbers of various capabilities based upon rigorous analyses are required to hold at risk a sufficient amount of what our potential adversaries value without accepting undue risk ourselves while **providing the President the widest range of options using the minimum level of force intended to achieve our objectives?**

Third, and related, given the clear risks and elusive benefits inherent in additional deep reductions, the burden of proof should be on those who advocate such reductions to demonstrate exactly how and why such cuts would serve to enhance our national security.

Finally, I believe that an early strategist's metaphor that nuclear planners are like homebuilders remains true today. A wise architect does not design only for benign environments, but for the worst weather conditions one can reasonably anticipate. We have to consistently maintain a *building code* for our strategic forces to ensure they can weather the most stressing scenarios we can reasonably postulate. On that note I'd like to close with a story related by Sir Michael Quinlan:

> There exists a fine town hall in Windsor, near London, with a pillared portico designed by the great architect Sir Christopher Wren. It is recounted that when he first submitted his plans the town corporation complained that there were not enough pillars holding up the portico roof. Under protest, he added extra ones; but he made his point, visible if you look closely to this day, by arranging that the added pillars stop a few inches short of the roof. Now, it may be true that some components of US deterrent planning and force provision have been "overkill" and were corporation pillars rather than Wren ones. But it cannot be doubted that the roof needed pillars; and that it was safer with too many than with too few.

In closing, I firmly believe we need to carefully manage the risks and uncertainties we face in this new strategic era. Our strategic enterprise and particularly our force structure and doctrine needs to be robust, flexible, and credible such that we always maintain the ability to both reassure our allies and to convince potential aggressors to choose peace rather than war, restraint rather than escalation, and conflict termination rather than continuation.

Save The Dates:

- **Corporate Benefactor Days** -
  1-2 February 2012 (by invitation only)
  Hilton McLean Tyson Corners

- **Submarine History Seminar** -
  April 2012 at the National War College.

- **Submarine Technology Symposium (STS)**
  15-17 May 2012
  The Johns Hopkins University Applied Physics Laboratory

- **Annual Symposium and Submarine Fall Cocktail Party**
  17-18 October 2012
  Fairview Park Marriott, a new venue

2011 NAVAL SUBMARINE LEAGUE SYMPOSIUM
ADMIRAL KIRLAND H. DONALD, U.S. NAVY
DIRECTOR, NAVAL REACTORS
19 OCTOBER 2011

ADM Mies, thank you for the warm introduction. Fellow Flag Officers, distinguished guests, Submarine Force, and Naval Submarine League members: it is a privilege to be here again this year to discuss the future of our community. Thank you to the Naval Submarine League for hosting this symposium and to all the individuals that helped to put this event together.

The Submarine Force operates in complex, high consequence environments where vigilance is always required. In times like these–with the design of a new submarine class in progress, continued operations with an aging Fleet, and exceptionally high public sensitivity for technology gone awry–any sort of news worthy failures will certainly undermine the public's limited trust in our abilities and significantly increase the difficulty of our work. Therefore, it is imperative that the Submarine Force continuously embody the fundamentals that have made us so successful.

The Naval Nuclear Propulsion Program's history of success is sustained by a strong culture of careful and conservative engineering. We honestly assess what is unknown, pre-engineer tests/limits/margins as appropriate, take cautious approaches to change, and formally include diverse and dissenting opinions in decision making. These fundamentals keep the Program technically grounded when facing challenges under external and economic pressures.

As with any intelligent organization, our Program not only fosters a culture that analyzes its mistakes and then shares the lessons learned with others to promote improvement throughout the enterprise, we also examine the mistakes of other organizations involved with high consequence technology in order to apply their lessons learned to our organization.

For my part today, I will discuss some of the lessons from three unique and tragic events in order to remind all of us how our Program's fundamental principles keep us successful. I will also point out that as a community, we are not immune to catastrophic failures. But before I begin, a brief synopsis of those three events:

- First, the nuclear disaster at the Fukushima Dai-ichi Nuclear Power Plant was caused by two "beyond design basis" natural events that resulted in over 25,000 dead or missing, tens of thousands displaced, and infrastructure and industry severely impacted. As a result of the earthquake and tsunami, all facility and offsite electrical power was lost to reactor Units 1-5, causing a condition known as station blackout. Ultimately, the Tokyo Electric Power Company (TEPCO) and plant operators were unprepared to deal with the long-term station blackout, which resulted in core meltdowns and the release of fission products to the environment.
- Second, the catastrophe that sank the Deepwater Horizon drilling rig resulted in the death of 11 men, spilled over four million barrels of crude oil into the Gulf of Mexico and disrupted an entire region's economy while damaging fisheries and critical habitats. The leak was caused by the failure of a cement barrier in the ocean floor used to isolate the well. This failure was caused by the combination of using an insufficient volume of cement in the barrier, which was also poorly mixed, as well as an application procedure which required a certain degree of *finesse* from the operators to ensure success. Additionally, late changes to the temporary abandonment procedure resulted in the placement of an inadequate secondary barrier. And finally, the blowout preventer—a failsafe valve on the ocean floor that is used to seal the well—experienced mechanical binding and could not stop the flow of oil into the Gulf of Mexico.
- Third, the loss of USS THRESHER, which resulted in the death of 129 officers, crew members and civilian technicians. The most likely cause of the accident was the fail-

ure of a silver-brazed joint in seawater piping while operating at or near test depth which allowed high pressure seawater spray to short out electrical equipment and led to a reactor scram. At this point in Program history, a scram would have prevented the quick restoration of propulsion and when combined with a failed blow system, the crippled submarine could not make it back to the surface.

Now that I provided some background on the three events, I would like to highlight six fundamental principles that help all of us safeguard our technology from catastrophic events:

1. Robust safety and hazard analysis
2. Careful assessment and management of the risk versus reward associated with new technologies
3. Strong technical competency to ensure effective regulatory oversight
4. Strict management of emergent change
5. Accessible policy documentation to enable continuity, formality, and consistency in work execution and emergency response
6. Active sharing of lessons learned and documenting them for future reference

The first principle is the importance of safety and hazard analysis. As a Program, we must guard against the *compliance equals safety* mindset by fully evaluating all of the potential hazards associated with our work—including hazards not addressed by existing requirements—and ensure that systems and processes critical to safety are identified and prioritized.

As seen with the Deepwater Horizon accident, British Petroleum and the Mineral Management Service—the industry's oversight entity—focused on reducing the rate of reportable personnel injuries but ignored the potential for catastrophic events such as explosions and well blowouts. They falsely believed that their operations were safe based on personnel injury rate statistics and compliance with prescriptive, but inadequate, requirements.

In the case of the THRESHER accident, safety and hazard analysis was not sufficiently evaluated for the abilities of nuclear powered submarines to combat all casualties. Specifically, a court of inquiry found that the blow system was not adequately designed given the higher performance of nuclear powered submarines. World War II boats could only submerge to about 400 feet, while the newer, heavier boats were going significantly deeper and for longer periods of time, but no additional blow capacity had been built in or more stringent Quality Assurance applied. To counteract this oversight, submariners changed the way they did business to include design, material control, work control practices, and quality assurance. Born from this was the Submarine Safe Program, also known as SUBSAFE, to provide the maximum reasonable assurance of watertight integrity and recovery capability. Objective Quality Evidence became a way of life and we created an auditable trail to verify work was authorized, the materials were correct, the worker doing the work was qualified, the work was performed correctly, and the system was tested satisfactorily.

The Fukushima reactor accidents were the result of what is known as *beyond design basis* conditions caused by natural phenomena. While seismic and tsunami conditions were addressed in plant safety analysis and design, nothing assumed the magnitude experienced on that day. Knowing it is impossible to drive risk to zero, a careful and skeptical review of our assumptions and evaluation of our technologies' response to *beyond design basis* conditions, be they externally or internally initiated, is prudent given the high consequence of failure. Once the expected response is evaluated, consideration must be given to an organization's ability to mitigate negative consequences. Furthermore, Fukushima highlights the need for a realistic approach when evaluating the abilities of operators to work in the expected environment of a casualty.

The second principle is the importance of carefully assessing and managing the risk versus reward associated with new technologies. The implementation of novel methods in design work and new technology bring inherent risks with their benefits. The basis for deviating from proven technology solutions must

always be justified, intended benefits should honestly be weighed against intrinsic risks, and accumulated risk—particularly associated with hazards not covered by existing requirements—should be monitored. For new technologies with long development cycles, engineers must be willing to periodically evaluate the basis for implementing new technology to determine whether it still makes sense.

With Deepwater Horizon, government policy and regulation drove the oil industry to pursue rich oil reserves in deeper water, which pushed the limits of what available technology allowed. To sustain this, technological innovation largely focused on enabling exploration and drilling while advances in understanding the new environments and preparing for or safeguarding against new or evolving *pinnacle events* lagged.

The importance of managing new technologies is not just limited to internal developments. New external technologies may provide the ability to revalidate or update internal design bases. For instance, significant advancements in the physical understanding of seismic and flooding hazards may aid in protecting other facilities from the events experienced at Fukushima. Similarly, a more stringent evaluation of the numerous failures found while using the newly developed ultrasonic testing on THRESHER's silver-brazed joints may have prevented the tragedy.

The third principle affirms that strong technical competency is essential for effective regulatory oversight. For the Naval Nuclear Propulsion Program, Naval Reactors is solely responsible for oversight of the development, safe operation, and eventual dismantling of all of the Navy's nuclear assets. To do this, we employ the nation's top engineers and scientists as well as the Fleet's proven officers and enlisted sailors.

Conversely, the regulatory oversight of the offshore drilling industry became ineffective because the engineering capabilities at Mineral Management Service did not keep pace with that in the oil industry as they rapidly expanded into deepwater drilling. This lack of knowledge at the Mineral Management Service led to an overreliance on the oil industry for technical assessments and perfunctory reviews and approvals.

While the technical competency of Japan's nuclear oversight

division—the Nuclear and Industrial Safety Agency—is not in question, an organization's oversight ability is significantly impacted by its ability to collect and analyze data. During the Fukushima accident, the NISA's offsite center—a 15-minute drive from Fukushima—had no power or land/cell/satellite phone lines and the backup generator was not working. This left government officials dependent on TEPCO headquarters for information, which caused crossed signals at times and blurred the lines of command and control, hampering critical oversight.

The fourth principle stresses the need for us to manage emergent change. We must continue to reinforce formal concurrence and technical approval processes and not allow cost and schedule pressures to dictate the consideration of technical compromises and other mitigation actions in order to meet or recover schedules.

History shows that the Program was not always as good as we could have been on this principle. While not ideally designed by today's standards, THRESHER's blow system was most likely crippled by strainers the shipyard had installed—on its own—to prevent foreign material from damaging system valves. These strainers facilitated the growth of ice plugs in the air lines during an emergency blow that prevented air from entering the ballast tanks. Even though today this informal system modification seems inconceivable, at the time shipyards were allowed to make deviations to drawings without any oversight, which clearly undermined the ability of technical authorities to ensure the safety of alterations.

Similarly, British Petroleum and the Mineral Management Service did not formally manage changes to the Macondo well design and temporary abandonment procedures, making significant last minute changes with informal agreements via email. The lack of formal change management led to inadequate technical review of planned well conditions, which were attributed to the blowout.

The fifth principle is that accessible policy documentation enables continuity, formality, and consistency in work execution and emergency response. At the Macondo well, there was a lack of consistent and standardized procedures for critical operations such as the temporary abandonment of the well and the pressure test

used to verify the well was not leaking. While British Petroleum procedures stated the number of required barriers when isolating a well, the specifics of how to conduct this isolation were left up to Macondo engineers on an ad hoc basis. Since there was no written procedure for the pressure test used to verify the well was isolated, common practice allowed experienced operators on scene to analyze the test results and certify the well as sealed. However, at Macondo a lack of experienced personnel led to the misinterpretation of test data and with no formal procedure or technical guidance on station to state expected results, rig leadership did not request an offsite technical review of the data.

Accidents at Fukushima highlight the importance of having plant operators who are well prepared and well supported by technically sound and practical procedures, guidelines, and strategies. During emergencies, a clear and preplanned command and control system that supports streamlined decision making must be at the ready. Heated discussions between TEPCO and Japanese government officials concerned about the international perception of venting the reactors wasted significant amounts of time. Additionally, protocols prevented the plant manager from taking casualty actions for the high pressure conditions until permission was received from top officials at TEPCO and in the government of Japan.

As I stated earlier, intelligent organizations learn from their own mistakes as well as the mistakes of others. As operators and maintainers of high consequence technology, we must be ever vigilant in our search for learning opportunities. This leads into my final principle that actively sharing lessons learned and documenting them for future references is a cornerstone of our success.

If you look at the early history of submarines, between 1915 and 1963 the Navy had 17 non- combat losses of submarines—an average of 1 every 3 years for a total of 473 submariners killed. With this statistic in mind and after reviewing the piping system failures of some other early nuclear submarines, it seems that a tragedy like THRESHER was almost inevitable because the Submarine Force was not learning from its mistakes.

- USS SKATE had two silver-brazed joint failures, one during each shot of shock testing.
- USS ETHAN ALLEN had a threaded plug blow out of a strainer in the trim system, there were minor fires and a reactor scram.
- USS SNOOK found a five-inch silver-brazed seawater line leaking.
- USS THRESHER had two failures during builder's trials – the first was a seawater vent line that was made of steel instead of monel pipe and then a 1-inch joint in the trim system that lacked a silver-braze insert ring.

Likewise, a failure to actively share lessons learned in drilling led directly to the loss of well control and blowout at Macondo. The National Commission concluded that if the crew on Deepwater Horizon had known and trained on a very similar incident—a near-miss that occurred in the North Sea a few months earlier—their accident and subsequent oil spill would likely have been averted.

The organizations involved in all of the previously mentioned accidents did not intentionally walk towards disaster. Keep in mind all the organizations involved in these tragedies had engineers and operators working with highly complex systems operating in difficult and challenging environments. Additionally, they were routinely faced with decision points that required engineers and managers to make judgments impacting the balance between acceptable risk, continuous cost and schedule pressure. In all cases, the impact of failure had significant consequences for both personnel and the environment.

Every day nuclear powered submarines and aircraft carriers *have the watch* throughout the world. Our shipyards safely and effectively build our newest vessels while overhauling and refueling our current workhorses. And a pinnacle milestone for our Program will occur next month as USS ENTERPRISE celebrates her 50th birthday after having safely steamed over 2 million miles and completed 20 full deployments.

As the Naval Nuclear Propulsion Program undergoes a broad and significant demographics shift, and without recent marquee

failures or Cold War challenges to reinforce our principles and focus our efforts, the lessons presented by these three incidents could also be seen as timely warnings to stave off our own organizational arrogance and success-driven numbness to the serious risks involved in our daily work.

Thanks again to the Naval Submarine League and to all of you for participating in this symposium. I am looking forward to the remaining presentations and I would be happy to take some questions.

2011 NAVAL SUBMARINE LEAGUE SYMPOSIUM
VADM JOHN M. RICHARDSON
COMMANDER, SUBMARINE FORCES

UNDERSEA WARFARE REVIEW

As I get started into my topic, I'd like to remind you of how we're executing the Design for Undersea Warfare to date, what we've done and what we're about to do. I'd like to give you a peek into some of the changes we have coming in the future. We're considering the next update to the Design, which will likely be issued in the summer. One huge event that's happened since we last got together is that we have a new CNO, Admiral Greenert. He has blown out of the starting gate with terrific energy and clarity in his communication. We're hearing what he's been saying and it's music to our ears. His Sailing Directions are very well aligned with the Design. His plans and his three tenets, which will guide our decisions are "Warfighting First, Operate Forward and Be Ready." These two calls for action are very well aligned. The central element of our approach is to recognize and support the submariner. The submariner is the key element of our success. Admiral Caldwell and Admiral Johnson and many more submarine leaders, down to the CO's and XO's , are doing real things to make this come alive.

In the personnel world, we've made good progress to strengthen and support our team. We've put in place a new enlisted supervisor retention pay and other incentives that are specifically designed to show the value we place on those folks that have the experience and the expertise, and to motivate them to stay our senior enlisted leaders in positions such as Chiefs of the Boat, Engineering Duty Master Chiefs (EDMCs), and other senior leaders. Regarding EDMCs, we've issued guidance for this position. Defining and strengthening their role in engineering throughout the boat. For our junior submariners we're about to issue a comprehensive program that strengthens their resilience throughout their career. This program starts when these first-time Sailors report to their submarines for the very first time. There's also a different program, sort of a steroid injection, for sea-

returnees. It's got elements that provide consistent support throughout their time at sea on boats. We will ensure that the CO's command team will have all available resources to detect the challenges his crew will face both operationally and from the command climate stand point. It also includes the families, engaging the ombudsman and the family readiness groups, so it's comprehensive.

We've also just completed the final phase of a three-phase approach of conversions to establish our integration of IT specialists onboard. There are now about 300 submariners in this new IT rate. The combination of that conversion of 300 people and the influx we're receiving from the new submarine IT school, is now giving us expertise to fight and protect ourselves in the cyber and virtual battlefields. These are just a few examples of how we're putting effort into supporting that submariner who is the center of everything we do. It starts with recruitment and with all sorts of recruitment incentives. We're also implementing community management incentives, retention incentives and waterfront readiness so that we see everything. And the teams that bring these plans together include folks from BUPERS, from the TYCOMS and from all of the commanders. It's truly an operational team. You're likely to hear a lot more about this tomorrow from the force master chiefs.

I'll next discuss our effort to empower the commanding officer and sustain warfighting readiness. When a crisis erupts, submarines provide the best value when they are underway, ready to respond, and providing information and capability to the nation's leaders. Just as with our personnel programs, this has been more than a slogan—we've exercised it.

First and foremost, our SSBNs do this day in and day out and, because they do it so well, they operate forward in their patrol areas providing eye-watering reliability, eye-watering connectivity and amazing resilience. The SSBNs are doing terrific work and we are making adjustments to increase their independence and resilience at sea and sustainability to reduce the number of near-port events and personnel transfers to improve their overall deterrent posture.

In the SSN world, we've been building our muscles and strengthening the entire force. There's a difference between strengthening a particular individual unit or squadron and the entire force at the operational level. Our first effort in this was a command exercise conducted this past summer which walked us through the detailed planning efforts that would be required to serve the Submarine Force on the Atlantic Coast in support of any crisis that arises. We learned a lot from that exercise.

The second phase of that exercise was Hurricane Irene. When Irene moved up the East Cost, we actually sortied the entire fleet. We had seven SSNs at sea when the storm hit, we got seven SSNs underway in about 48 hours for storm avoidance, and we had five SSNs forward deployed. When you combine that with the four we had in depot maintenance, there was just one SSN we could not get to sea, and that's a pretty good record. They remained underway for about a week on very short notice, stopped maintenance altogether, and it was a super gratifying outcome. But the next question was, "what if it had been for war? What more would have been required?" We decided to get the squadrons and the COs together and went to another level of detail where we laid out, "I think this many days would have been required for training, this many days for certification, this much for weapons load," and then we compared. The Irene sortie statistics showed we exceeded requirements on all accounts.

This fall we'll take it up another level. Admiral Caldwell and I will link together and we will sortie and exercise the entire force. SUBPAC and SUBLANT together in response to a war plan. This will be a terrific event.

I won't take too much time to describe the administrative efforts that we've got underway, but we have been very vigilant. In fact, there's a terrific effort to make sure we capture all lessons learned and documented in formal orders, instructions, NWPs, and other vehicles so that we capture all the information in support of effective and efficient operations.

There are a few programs that I want to tell you about that are around the bend. Training and qualification programs—we've brought those two programs together, so now we have one program that trains and certifies individuals to do the job they are

assigned. Then, there will be another certification process to certify the team, and all of those things use some computer software to lighten the administrative burden as much as possible and enable a unified approach to training and qualification. We've brought together the philosophical approach to training and qualification between the forward and aft parts of the ship so engineering and tactical operations training are very similar.

We also take great pride in being a learning organization, and we now have a very recognizable spectrum of tools—from very time-responsive to formal and permanent changes to requirements. On the time-responsive side, we'll issue a message before we've done all of the analysis, to make sure everybody gets the word quickly and can check to see if they are vulnerable to the same situation. Then there's sort of a middle ground where we've got initial analysis from the technical and operational communities, and we can put those out in a series of messages or monthly newsletters that may have directive authority to make short-term changes. Finally, where there are enduring lessons, we formally institutionalize these things for the long term by making a change to the appropriate reference. It's one system, a set of tools that everybody recognizes, so that when something happens throughout the force, everybody's locked in to reacting, "Who else needs to know about this? What do I need to do to make sure everybody else gets the word? It's time for that alerter message, and it's time to start the investigation." There's this responsibility to inform the force and we're doing just that.

Related to learning, we're also about ready to issue an instruction for assessment to formalize and standardize the way we self-assess and improve...again, a common language throughout the force.

At the NDIA event in Groton, I outlined a framework for maturing technology and how to bring new ideas into the Submarine Force. This framework will allow for a responsible and predictive way to mature technology that is consistent with our principles.

Again, not to be too bureaucratic, but I wanted to share some of those things that will sharpen our performance and let you know that we are formalizing these in instructions and other

lasting vehicles. Getting the right information into the right people's hands at the right time with minimal burden. There's a lot more, but I think you can probably see the direction we are heading. It's about real things that are happening to enhance warfighting and operations, about enhancing unique contributions in order to remain ready to get underway on short notice, to remain on alert, and to remain undetected behind enemy lines.

As we address this environment that is changing very rapidly, we're starting to look forward to the first updates to the Design. The Design, by its nature, is flexible and responsive and made to be self-examined and always have its assumptions questioned so it can get better and adapt to the changing reality. This effort led my staff and me to try and come up with a better name for our current situation than *Post-Cold War*. I mean, it really has been decades now. It's really a lack of imagination to continue to call it that. So what is it? It's really a measure of the complexity of the situation with which we find ourselves. So, we're doing our best to characterize this environment, particularly for undersea forces. As we did, we couldn't help but look back because we also want to be firmly grounded in the principles that Admirals Donald and Padgett highlighted as being our foundation. We can't leave those behind. Our way forward has got to be firmly founded in our history.

It's in this context that I'd like to propose that we've already entered a new phase of undersea warfare. I'm going to propose that this is the fourth phase. I'm going to step through these things quickly and describe them in terms of missions, the warfighting domain, the industrial base of technology and the people. It's not necessarily one mission replacing another. It's one mission being added on top of the previous ones. As the Design clearly states, it's only going to get more complex. It's also not linear worldwide. We can talk about phases, but I think sometimes that lulls us into a false sense of security. A predictability or linearity of number two can't come until number one is done, or that sort of thing. It doesn't happen that way. It hasn't happened that way in history. You can be in Phase 3 in this particular environment of your AOR and Phase 1 in another, so you've got to keep resolve and balance in all those places. The Germans were a little bit

ahead of us in the early phases of undersea warfare. They brought technology to bear faster, but we caught up with them.

There are four phases which I challenge you to help us refine and flesh out.

Phase 1 was the exploration phase. Its primary mission was to figure out how to take a big chunk of steel, put men inside, submerge it and then make sure it came back. I think this phase came to a close with the introduction of the fleet boat, which had the range and speed to be a warfighting platform, but was still vulnerable in many ways.

The second phase was WWII. The mission was commerce interdiction and sea denial. The warfighting domain was really geographical. You could put your submarine on the sea lines, in the battle lane and go sink the enemy. The industrial base at this time was fluid...an assembly line approach to making submarines, in fact, multiple submarines per month. The people, of course, were the *greatest generation*. Even at this early stage, where submarines began to make a warfighting contribution, you could see that this was going to be a very asymmetric business. Even at our largest complement of submarines, the people were six percent of the Navy. We had the best of the best then, as we do now. Only about six percent would graduate submarine school. That six percent of the people in the Navy sank 55 percent of the tonnage.

Phase 3 was the Cold War. Our missions were deterrent. And because it became deterrent versus deterrent, ASW arose as a way to go against SSBNs. Our maritime strategy adapted to that reality. The warfighting domain was now more than geography—it was also oceanography. The advent of nuclear power allowed submarines to stay submerged for long periods of time and this became their new environment. So, just as in land combat you have to seize the high ground; in this new ASW world, we had to seize the acoustic high ground—the oceanographic high ground. The industrial base was characterized by just a tremendous infusion of engineering, optimism and forward momentum. Lots of shipbuilders and many ships per year. Lots of optimism. As I've said before, we built the first SSBN, GEORGE WASHINGTON, more than 50 years ago, and once we committed to that concept, it all came together through tremendous energy. I think this is where

the genius of Admiral Rickover manifested itself most aggressively. He foresaw and anticipated virtually all of the problems that technology could, and did, introduce. In terms of the people, the baby boomers in that generation were also technologists with tremendous optimism coming back from the war. They were also the Cold Warriors. They cemented in place what we would eventually call the submarine culture that Admiral Donald spoke about...the balance of using advanced technology with very deliberate controls. Reliable, safe, effective, decisive. This is when the term "You're a nuke!" came to be a badge of pride.

Those are the first three phases—rough, challenging. So what's this fourth phase? What is it all about? I believe it is characterized by access and networks. Our missions are going to be a lot about stealth leading to access. About being able to go down to vast parts of the world in the ocean where nobody else can go. The introduction of long-range precision weapons, the ability to act from a great distance with great speed and precision, is going to continue to change the character of warfare. That technology is only going to get cheaper and proliferate. What China can do today, other nations and even non-state actors are going to be able to do in the near future. They are going to be able to buy this capability off the shelf. In addition to explosive weapons—missiles and bombs, you've got this entire cyber domain and information warfare. We need the people with the education and the ability to fight that. The geographic and oceanographic warfighting domains will still remain relevant, but now you've got this cyber domain and information warfare to contend with. In this fourth phase, to be seen is to be vulnerable. Range from your aggressor is going to be less and less protective. In the current, phase-four industrial base, there are very few shipbuilders. There's very little prototyping and relatively low procurement rates. This does not scale gracefully, and the non-linearities that come with that will characterize our current environment. In terms of people, they are going to be tougher to find. There is a smaller portion eligible for service and the skill sets that those people are going to have to bring to the fight are vastly different, just as they have been different in each of the phases in our history.

I will comment on a question that was asked about this new generation. I would agree completely with Admiral Donald and I would say that I was in a seminar where we were talking about this, and it's a big deal. The thing that really captured my thinking was a time when, as an experiment, they provided a group kind of like us, our generation, and a group of younger people, a list of virtues, and they said, "I want you to go off and prioritize these." The two teams came back and, in terms of the principles that drive a generation, theirs were the same as ours.

What does the fourth phase mean? What are the implications for us? I'd just like to outline two. One is, if we agree that we are entering a new phase, and we're formally recognizing that the Cold War is over, I think that we have to put together an appropriately scaled effort to capture our history in the Cold War. We can read all the terrific tales of our WWII submarines and skippers as they took the fight to the enemy. These are the tales often read at ceremonies. They deserve every bit of that recognition. But there is an entire generation of heroes whose exploits remain classified and unspoken. We need to address that. We should declassify what we can, keep classified what we must, and get those lessons—classified and unclassified—out to the force so we can learn what that generation taught us. If you go back 25 years from now to 1987, it's almost the end of the Cold War! We're 25 years past it and there's a tremendous amount of history there. Part of this recognition effort includes resurrecting our strategic expertise in nuclear deterrence theory. That's another part of that era.

The other thing I think we must do is start to posture ourselves for the future. We're just probably not going to be able to predict our future, but we've got to give it our best shot. We were late to see the impacts that acoustics and radar had on vulnerability for submarines...slow to adapt to the SSBN-centric approach to the Soviet strategy, and I think we need to ask ourselves how we're doing in transition now. Is this a new era or phase of undersea warfare? We must do our best to address this question. We're not always going to be accurate, but we must try, and I can't think of a better team to wrap their minds around this very challenging problem than all of you working together with us. And as we do

this, I think that we're all in agreement that we must retain those fundamental principles that Admiral Donald spoke about, and have served us so well to date.

Thank you very much.

2011 NAVAL SUBMARINE LEAGUE SYMPOSIUM
RADM FRANK CALDWELL
COMMANDER, SUBMARINE FORCE
U.S. PACIFIC FLEET
19 OCTOBER 2011

Aloha. Thank you for the kind introduction. It's great to be among such a distinguished group of submariners and friends of the Submarine Force. I never thought I would be standing in front of such a group as the Commander of the Submarine Force US. Pacific Fleet—so it is truly an honor that I've been asked to speak here today.

To put that honor in perspective, I was raised the son of a submariner and learned at an early age who ADM Rickover was and what he stood for—in fact in my house, we learned early that when you made a mistake, the best way ahead was to confess quickly that you were wrong, cite the root causes for your deficiency, and then lay out your own corrective action. And true to form, when Dad got home, he always asked what he should do about the problem. Woe to the son that had not thought through his corrective action beforehand! I am certainly a product of that submarine upbringing and proud of it. There are some in this room who also played a role in my early impressions of the Submarine Force including Ron Thunman and Jerry Holland.

ADM Mies, RADM Padgett, thank you for hosting today's event—and thank you for what you do to tell the story of our Submarine Force and its importance to the nation. Also thanks to the members of the NSL and our corporate benefactors.

I took command of the Pacific Submarine Force on 10 Dec last year having relieved Doug McAneny. I inherited a Force that was in great shape—and I want to say publically "Thanks" to Doug for all that he did to take care of our Force.

Like prior SUBPAC commanders, I immediately thought of the history of SUBPAC and those who had gone before me. As you know, there is a rich history in the Pacific that you're confronted with immediately. As I thought about my new job, I thought of the submarines and submariners sitting at piers around

the Pacific on the night before the attack on Pearl Harbor in 1941. Their world would change overnight. Without their choosing, they were thrust into a World War with the training they had received, the ships they were assigned, and the weapons and sensors that the Navy had bought. As history has judged, they were ready in some aspects, and yet not ready in some very critical areas. Clearly, they were a resilient force that adapted and overcame the challenges confronting them—and of this we are extremely proud to this day!

I wondered what world events would influence my tour and I questioned whether we were truly ready. I could not escape the truth that at some point in the future, at a time that we may not be able to decide, perhaps in a place that we may not have thought much about; there will come a time when one of our submarines will be in a position to execute a mission directed by a COCOM or perhaps the President. That ship will be as prepared as we can make it, equipped with the best equipment we can buy while balancing conflicting demands in a fiscally challenged environment. At the core of that ship's ability to achieve success will be a single Commanding Officer—the product of years of training and experience—and his crew—alone and unafraid to make the right decisions and to do what the nation needs them to do! No matter how much we would like to, and even with the advent of increased communications bandwidth, we ashore will not be in a position to determine the success of that ship at that point. It will be solely a function of what we delivered and what the Commanding Officer and his team are ready to do!

Are we developing our leaders to be ready to handle the challenges we will face? How well have we thought about our warfighting role in addition to the peacetime intelligence role that tends to dominate much of our focus? How can we innovatively tackle the warfighting challenges facing the COCOMs and for that matter, how well do we understand the warfighting gaps and shortfalls facing the COCOMs?

These questions and others like them led VADM Richardson, RADM Connor, RDML Breckenridge and me to develop the Design for Undersea Warfare—a framework for action to sharpen our focus on warfighting today and into the future. We defined our focus on three lines of effort:

- Ready Forces
- Effective Employment
- Future Warfighting Capabilities

As VADM Richardson has already discussed, these lines of effort are remarkably consistent with the Chief of Naval Operation's *Sailing Directions* published just a few weeks ago. I can tell you that the Design for Undersea Warfare has us well positioned to deliver on the tenants called out by the CNO, specifically: Warfighting First, Operate Forward, and Be Ready. You heard Vice Admiral Richardson lay out the Design and discuss the first line of effort, Ready Forces. I will focus on the second line of effort, our main line of effort, Effective Operations and Warfighting Today.

As I've discussed in previous forums, there are three goals under this line of effort:

- Optimally to employ our undersea forces independently or as part of a team in support of operational or warfighting responsibilities.
- Reliably and professionally to accomplish the missions tasked by the operational commanders while managing risk and stealth.
- To be ready to go to war and immediately execute the combatant commander's direction.

As a way ahead, we defined three Focus areas to help us achieve these goals

1. The development of theater specific Undersea Warfare Campaign Plans.
2. The deliberate and planned demonstration of warfighting capabilities, and
3. Improving operational availability of our undersea forces – or as I like to say, "Sustaining our advantage!"

In very simple terms, what this all means is this: That we start in each theater with a detailed understanding of the OPLAN and our warfighting responsibilities. We clearly articulate, by theater,

the requirements for undersea forces in terms of expertise, experience, system and weapons capabilities. And then we clearly identify any gaps. This is called the USW Campaign Plan (specific by theater and updated each year). From this we develop the employment plans for every submarine that comes into theater—we call this *deploying with a purpose*—demonstrating capabilities in theater where possible, crystallizing our Commanding Officer's focus on warfighting, learning as we go, gaining experience and confidence in our abilities, and proving our readiness to the Fleet and Combatant Commander. And, along the way, we stimulate innovative thought in our wardrooms and on our ships about how to close warfighting gaps. Finally, to be successful, we must solve the problems that challenge our ability to remain on station—this is the third focus area of Sustaining our Advantage.

My message for you today is that we are absolutely committed to these goals and focus areas—they are steering the dialogue every day at the Type Commander and at our ISICs. We are stepping out on the focus areas... and success in achieving these goals lies in the hands of our most effective weapon—our people—**our single most competitive advantage!** In the short time since we rolled out the Design, our people have brought the tenants of the Design to life.

As a way of portraying this, I'm going to tell you about our leaders around the Force, and in doing so, I'm going to tell you what they are doing every day to operationalize the Design for Undersea Warfare, to continue the proud traditions that those of you in this room invested in, and to ensure our Submarine Force remains the preeminent undersea force in the world today. It's an all-star team—focused first and foremost on warfighting and operational excellence!

Every day of every year, there is one team that lives and breathes their OPLAN—they are experts in their war craft, they practice it frequently, and stand ready at a moment's notice to execute tasking directly from the President. No other force in the U.S military has this direct relationship with the Commander in Chief. This is our SSBN Force—the officers and crews who sail from Bangor, Washington and Kings Bay, Georgia in relative silence, unheralded, carrying the proverbial *big stick* President

Theodore Roosevelt professed. These men know that it is not enough to say you have a deterrent force—instead, that Force must be practiced and must repeatedly demonstrate their readiness. They must live and breathe their mission in order to be a credible force! I mention this team first, because as RADM Barry Bruner may discuss, the OHIO replacement program is the Submarine Force's number one investment priority—a critical capability for the nation, as we look ahead to the next decades.

At the helm in Bangor is Rear Admiral Bob Hennegan leading Submarine Group Nine, and in Kings Bay RDML Joe Tofalo at Submarine Group 10—we could not ask for two finer leaders overseeing the daily readiness of the nation's survivable deterrent force.

Both of these leaders are laser-focused on strategic deterrence, and as we implement the elements of the Design we are sharpening the tip of this spear. I cannot discuss the specifics in this forum, but we are looking hard at everything from our postures, our patterns of operation, our communications, and our continuity of operations plans. We are moving out and have already instituted efforts to expand our play in USSTRATCOM's Tier one exercise, GLOBAL THUNDER.

The hardest working man in the Submarine Force is Commodore Paul Skarpness at Submarine Squadron 17—he leads our largest Squadron with more crews that any other in the U.S. Navy. Paul keeps the undersea leg of the nuclear triad strong. As you know, today's strategic environment is a dynamic one with the New START treaty and the Nuclear Posture Review, our ballistic missile submarines will be increasingly more important into the future with the responsibility of an increased share of our Nation's warheads. Paul's track record includes:

- Since November 2010, 16 SSBN patrols have been conducted in the Pacific—for a total of 1164 underway days.
- One of those patrols was a 105-day patrol by USS MAINE (Blue).
- And importantly, Paul oversaw the return of USS NEVADA to strategic service following an Engi-

neered Refueling Overhaul; and a successful Demonstration and Shakedown operation. We're fortunate to have one of the NEVADA Commanding Officers on the agenda tomorrow, CDR Alan Shrader, to give us his perspective of the SSBN Force.

Combined with the efforts of Submarine Squadron 20 and Commodore Eric Halloway in Kings Bay, I'm proud to report that our SSBN force is ready today—but be assured we are not resting—every day we are critically assessing that readiness to ensure we are delivering on the nation's most important element of national defense!

Shifting gears, this spring, the world saw the firepower an SSGN can provide when USS FLORIDA participated in coalition strike operations. This marked the first time an Ohio-class guided-missile submarine launched a Tomahawk Land Attack Missile in conflict. I won't steal CAPT Tom Calbrese's thunder from his pitch tomorrow, but it's remarkable that FLORIDA was deployed nearly 15 months away from CONUS when she executed her tasking—this is the hallmark of being ready for our warfighting responsibilities—it's exactly aligned with the principles in the Design—and, this event highlighted how rapidly we may be required to transition from Phase 0 to Phase 2 operations.

Our SSGN force is prepared for their responsibilities by two fantastic leaders, in the Pacific, CAPT Dennis Carpenter (CSS-19) and in the Atlantic, CAPT Steve Gillespie (CSS -16).

The pace of preparations for SSGN crews is astounding, because these teams must be certified for their operations in the trainers, and then rapidly transition to operations at sea within a few days of arriving in theater to take the ship. There's a reason we have elected to put second tour COs on these ships—it's because of this pace and the scope of some of the most demanding missions in the Force today.

You might be interested in how we're preparing our GN crews under the Ready Forces line of effort—Commodore Carpenter's certifies his crews using a Command Training Exercises—we call it CTE—this is a 4 day, around-the-clock event, in the attack center for all of the ship's control room teams. During this

certification event we require watch turnovers, operations briefs, and reconstruction briefs exactly like when the boat is at sea engaged in a mission. The scenarios are decision rich; we push the envelope with higher contact densities and CPAs than would be possible in at-sea training; and importantly, we get to see how the crew really operates under stress, especially when they're tired and when the CO might not be around. The Bangor SSGN Commanding Officers will tell you that they do not look forward to these CTEs because it is a demanding event, but they will also tell you that the experience is vital to their success at sea.

These SSGNs provide the Combatant Commander with SOF delivery and firepower combined with a submarine's stealth that provides an incredible conventional deterrent and makes potential adversaries take note. It's no wonder these ships are in high demand. Each one of these submarines deploys for over a year. In Fiscal Year 2011, our Pacific SSGNs were deployed for about 430 days—an amazing operational tempo for two hulls. The same story is true for the Atlantic where the SSGNs deployed for a total of 350 days, with one ship, FLORIDA participating in combat operations.

In our thinking about the Design and what the SSGNs bring to the fight, Commodore Carpenter is focused on streamlining the timeline of delivering effects on target in a call for fire scenario—specifically, to deliver a strike on short notice, for example a strike called in by a SOF team on a fleeting target or perhaps in support of troops in contact, or to target a mobile launcher in response to time sensitive intelligence. We are working hard on this CONOPS and have already conducted some exercises at sea, including a live fire event. In the next year you can expect some additional events to help us hone this capability for the Submarine Force and further demonstrate this capability at sea.

As you know there are two Development Squadrons in the Submarine Force—both play integral roles in advancing focus areas in the Design for Undersea Warfare.

Captain Bill Merz at DEVRON 12 is doing a fantastic job! Bill is absolutely committed to understanding the demands of both Submarine TYCOMs. In an effort to improve the man-machine interfaces of our tactical systems, Bill is hosting a conference in

San Diego next month entitled, Tactical Advancements for the Next Generation or TANG. The central idea behind the conference is to leverage the creative energy of a select group of Junior Officers to suggest improvements for future generations of submarine combat systems—these young officers know how to operate an IPAD intuitively, why not the submarine fire control system?

Across the country, Commodore Brian Howes is at the helm of Submarine Development Squadron 5—home to our Navy's Seawolf-class submarines, including USS JIMMY CARTER and the Deep Submergence Unit. Brian's leadership was critical in the Submarine Force's demonstration of access in the harsh Arctic environment earlier this year when USS CONNECTICUT deployed to the Arctic for combined operations with USS NEW HAMPSHIRE. As you know, these operations allowed us to assess our readiness, increase our operational experience in the region, and advance our understanding of the Arctic environment.

Brian is also our lead for the Deep Submergence Unit, which this year participated in the multinational exercise Bold Monarch off the coast of Spain. During this exercise we demonstrated the ability to conduct submarine rescue with a variety of other countries including a Russian Federation submarine, ALROSA (from the Black Sea Fleet). This was the first time a U.S. system has ever mated with a Russian submarine. I could talk for a while on this topic, but Submarine Rescue, the central topic of SUBPAC's annual Asia-Pacific Submarine Conference—now eleven years and running strong—is an important engagement opportunity with countries throughout the world. Most recently we held this Asia-Pacific Submarine Conference in Lima, Peru, and included submarine representatives from nearly 20 nations. Our conference next year will be held in South Korea.

Brian is also at the lead of another very important area in operationalizing the Design, specifically to align Submarine Force efforts and to advance our vision and CONOPS for UUV employment, including a large diameter UUV with sufficient payload and endurance to tackle a wide range of peacetime and wartime missions. This is very exciting work, unfortunately classified higher than the discussion allowed in this forum.

I'd like to shift gears again and highlight the operations of our SSN Force:

- In the Pacific, 16 attack submarines have operated forward since last December, and in fiscal year 2011 our Pacific attack submarines deployed more than 2,450 days.
- From the Atlantic Force, we had 9 attack submarine deployed forward in the same amount of time, two of which, USS SCRANTON and USS PROVIDENCE were involved in combat operations off the coast of Libya.

Delivering an SSN Force that is trained, maintained and operating with a full understanding of operations across the spectrum depends on a team of superb Commodores in each of our Submarine homeports and a thoroughly focused Submarine Group 2 team led by RDML Rick Breckenridge. These commanders are at the front lines in developing our Commanding Officers and their crews to excel in demanding forward operations. Let me highlight the contributions of some of our stalwarts:

Commodore Rich Correll at Submarine Squadron 11 in San Diego is in the unique position of being located at the home of our Navy's 3rd Fleet. In addition to training his own ships for deployment, his submarines participate in deployment preparations and Fleet exercises for nearly all Pacific-based Carrier and Expeditionary Strike Groups. His boats have also maintained a vital relationship with our South American partners, and they are currently hosting CS CARRERA as part of COMSUBFORs Diesel Electric Submarine Initiative—an important program and part of many opportunities that we have to operate and advance our skills versus diesel submarines. Also of note, one of his ships, USS TOPEKA participated in the Peruvian Submarine Centennial earlier this year, and in fact led the parade of ships that was part of the Centennial celebration.

Even farther from our home waters, one of Rich's boats, USS ALBUQUERQUE is advancing another critical capability under the Design, through her participation in testing the launch and

control of a small Unmanned Aerial System (Switchblade) equipped with sensors for over the horizon applications. The ability of the Submarine Force to use this type of technology in the same ways other forces are today—for ISR, Special Operations, Maritime Interdiction, over-the-horizon targeting—is incredibly important. This capability is a potential game-changer that dramatically expands our operational reach. And impressively, it is a capability that went from a Power Point concept to a tactical demo where the crew operated proficiently in just 34 months.

This is exactly what we're talking about when we discuss the Demonstration of Capabilities under the Design—putting technology in the hands of the warfighter and see what we learn—and importantly, we exercise a *pull* from the Design's third line of effort to gain operational capability in the Fleet before typical acquisition timelines.

In another great example of moving out on the Design, Commodore Stan Robertson at Submarine Squadron 1 recently seized an opportunity to take on a significant warfighting challenge—Stan worked with my staff to create an exercise in which USS Greeneville tested the ability to operate in an Anti Access, Area Denial environment. Over the course of five days, the exercise included a short notice simulated wartime underway, transit to station via potentially mined waters, and mission tasking that escalated from Indications and Warning to kinetic strike, and anti-surface and anti-submarine warfare. All of this was conducted in an environment where GPS, communications, and cyber capabilities were purposefully degraded. This was a very important exercise for the Force. We've learned much and indentified several action items which unfortunately I cannot discuss in this venue. We also learned some very important lessons at the operational level of war, and future exercises of this sort will include the TYCOM team.

I am convinced that the Submarine Force has the capability to stay ahead of this problem (a comms and GPS degraded or challenged environment), and to do so we will continue to train in this kind of environment, identifying our vulnerabilities, investing wisely for the future, and developing the tactics, techniques and procedures to ensure our access and war fighting readiness. As I

tell my team, we cannot wait for someone else to solve this challenge; we need to take it on ourselves.

Also in SUBPAC, we're about to deploy our 3rd Virginia-class submarine to the Western Pacific. In the past year, USS HAWAII completed her deployment, and USS TEXAS is currently deployed. Commodore James Childs at Submarine Squadron 3 will soon certify USS NORTH CAROLINA for deployment—these VA class platforms have proven their ability to operate forward, especially in the challenging littoral regions. Each deployment brings new lessons that we are clearly leveraging for future success. If I am not mistaken, we have never operated a new class of submarine so far from the construction yard so early in her life, and this comes with unique logistics challenges! The forward logistics to support the deployments of these new ships is no small endeavor, fortunately Commodores Robertson and Childs were the right leaders to make this happen.

Finally in Hawaii, I would be remiss if I did not mention Commodore Jimmy Pitts at Submarine Squadron 7. Jimmy has four deployments to WESTPAC under his belt, two while he was in command of USS TUCSON. He understands and knows the WESTPAC environment better than most, and as my number one war fighter, he epitomizes the Design's focus on operations and warfighting first! The proof is in four of his boats that have had extremely successful deployments in the time I've been at SUBPAC.

In the Atlantic CAPT Mike Bernacchi, Submarine Squadron 4 has pushed the tenants of the Design, especially in sustaining our operational availability. Mike has asked the maintenance organizations to rethink the possible. His well thought-out ideas and questioning of conventional wisdom has led to significant time-savings in system certifications—a benefit to operational availability across the Force.

At the tip of the spear is our only forward-deployed submarine squadron—Commodore John Russ at Submarine Squadron 15 in Guam. John oversees three boats in a demanding operational cycle that delivers presence in WESTPAC. John is also overseeing a changing of the guard, so to speak, in Guam as we've recently stationed the first of three VLS boats there with the recent arrival

of USS OKLAHOMA CITY. The changing face of Guam also includes construction currently underway on a new Submarine Learning Center and squadron headquarters on Polaris Point. John has stepped up his team's knowledge and critical thought of their war plans with a series of events designed to focus on the OPLANS. John's experience will serve him well as he heads off to be the CTF -74 Chief of Staff next year.

Our SSNs and SSGNs are carrying out their critical work for our nation in the forward-deployed areas in the Pacific, the Arabian Gulf, off the Horn of Africa, in the Northern Atlantic, and occasionally in SOUTHCOM. When we send them forward, our operational commanders RDML Phil Sawyer and his team at CTF-54/74, and RDML Jamie Foggo and the team at CTF-69 have the responsibility of orchestrating the plays for our deployed ships. Both of these leaders directly support our numbered fleet commanders in building and maintaining a network of strong alliances in the region and deepening relationships with emerging powers. They do this through an impressive array of exercises, port visits and bilateral or multilateral interactions.

RDML Sawyer and RDML Foggo have ensured that our submariners have *walked the battlefield* and are warfighting ready. Notably during the recent events in Libya RDML Foggo was intimately involved in calling the shots, and in WESTPAC Phil Sawyer has honed the operations of the finest Theater ASW team in the Navy. Both of these guys are playing pivotal roles in development and authorship of the Theater Specific Campaign Plans I spoke about earlier.

Being a ready Force also means we must maintain our submarines in optimal fighting condition. This is a less-heralded part of our business, but a very important one. So I want to say a few words about our crews in deep maintenance. Those who have been through it know that deep maintenance is hard business. Today we use the words of Pre-Inactivation Restricted Availability, Dry-docking Selected Restricted Availability, Engineered Refueling Overhaul, and Engineered Overhaul. Mention these words around any submariner and you will see a look of terror! But it is this business that keeps our national treasures—our submarines—

ready for operations. I'd like to acknowledge a few of those COs by name and crews that are slugging it out in the shipyards.

- I'm going to start with CDR Curtis Duncan and USS KEY WEST—nobody is doing it better than Curtis' team. He's brought tremendous energy, enthusiasm and focus to his crew—they are excelling in the shipyard because they have approached it with the same level of effort as preparing for a mission, and they are setting the bar for the rest of the Force.
- CDR Dan Packer and USS SEAWOLF crew are working their way through a particularly demanding period in the yards.
- CDR Gustavo Gutierrez and the USS PENNSYLVANNIA crew on the West coast have completed refueling and are working their way back towards strategic service, all that lies between them and that goal is a significant amount of testing including shift work and some very long days!
- And on the East coast, CDR Adam Palmer and the crew of the WEST VIRGINIA are working their way through a tough refueling overhaul.

These leaders are readying their ships for years of future service and ensuring that we can get the full life out of these hulls to meet the force structure plans described in the third line of effort of the Design.

While we are necessarily focused on the deep maintenance that keeps our ships fit to fight, out on the pointy end, we must sustain our ships for optimal employment. My key leaders in deployed submarine maintenance are Captains Pete Hildreth and Tom Stanley in command of USS FRANK CABLE and USS EMORY S. LAND respectively. Forward-deployed to Guam and Diego Garcia these ships sustain the operational availability of our deployed submarines which is typically well above 80 percent. This past year, as USS HAWAII deployed, the FRANK CABLE team developed procedures to tend a Virginia-class submarine and provided outstanding support to that historic deployment. These

ships also go where the Fleet commander needs them, maintaining ships and submarines and showing the flag:

- USS EMORY S. LAND spends a significant amount of time underway. In the last year, she supported our submarines in UAE, Bahrain, India, and Malaysia.
- USS FRANK CABLE not only services the forward-deployed squadron in Guam, but has also provided services to units alongside in Hong Kong, Malaysia, and the Philippines.

You also might be interested in the tender's expeditionary manning model which involves the FRANK CABLE continuously deploying sailors year round to supplement the repair maintenance team on EMORY S. LAND, thus allowing LAND to execute deployed SSGN, SSN and surface ship maintenance.

Finally, I need to mention a critical player in the undersea battle space. This team includes another Commodore, Captain Scott Rauch, the Commander, Undersea Surveillance. As Undersea Warriors, our IUSS personnel must be trained and manned to ensure critical information is available to the Combatant Commanders and national decision-makers. And as the TYCOM for the IUSS Community, I am committed to the advancement of this valuable capability.

Commodore Rauch has done a superb job. Since November of 2010, our Integrated Underwater Surveillance commands deployed 15 military crews aboard five Surveillance Towed Array Sensor System ships for a total of 1,365 days. These crews, along with the Sailors who have the watch at our Naval Ocean Processing Facilities, are critical to our day-to-day undersea domain. Under Scott's leadership, we've implemented a number of significant and positive changes to improve how we conduct undersea operations today. The list is long, but to give you some idea:

- To optimize SURTASS military crew manning, Blue and Gold units were created to sustain forward presence and place priority on these critical, at-sea billets.

- We also created an IUSS Continuing Training Manual model based on the Submarine Force training philosophy.
- We've opened a detachment of the Submarine Learning Center at one of the NOPFs, and commissioned new shore-based trainers.
- We have even built in Tactical Readiness Evaluations for the NOPFs and have conducted our first inspections at each site.

All of these initiatives are centered on the requirement to deliver full capability to our national leaders and combatant commanders.

I've covered a lot of ground this afternoon. I've talked about the principal line of effort in the Design for Undersea Warfare, and the great work being done to optimally employ our undersea forces, professionally accomplish our missions, and ensure our ships and crews are ready for war. All of these efforts are being driven by the strong leadership of our Group Commanders, Commodores, Major Commanders, and very dedicated TYCOM staffs. I'm proud of this team and even more proud of the submarine crews they lead. You can and should be proud of them as well—they are among the finest warfighting teams in our military today.

I started this presentation by questioning the readiness of our team—and I'll end by stating that we are indeed ready, but the threat is dynamic—and we are committed to staying ahead of that threat. The Design for Undersea Warfare provides the framework for the Submarine Force to stay ahead of future threats. As for resiliency of the Force, I think we've demonstrated that recently with the events that unfolded in Libya, and I also see it daily in our approach to deployed operations.

I'll close by going back to our Chief of Naval Operations' Sailing Directions:

- From the Operational level to the Tactical level, we are advancing our art and putting *Warfighting First*, ready today and looking toward the future.

- In every ocean and with every asset, we are *Operating Forward*, providing the options our leaders demand;
- And know this, that the Submarine Force clearly understands the imperative to *Be Ready*.

I can say with full certainty that we are sailing on course, full speed ahead.

Thank you for your time this afternoon.

NAVAL SUBMARINE LEAGUE ANNUAL SYMPOSIUM

BANQUET ADDRESS BY THE HONORABLE FRANKLIN C. MILLER, PRINCIPAL, THE SCOWCROFT GROUP

OCTOBER 20, 2011

Franklin Miller is a Principal at the Scowcroft Group in Washington D.C. He served in the White House as a Special Assistant to President George W. Bush and as Senior Director on the National Security Council. He also served for twenty-two years in the Department of Defense in a series of progressively senior positions under seven secretaries. During his career he had unusual influence on the evolution of national deterrence and nuclear targeting policy.

Admiral Mies, Admiral Padgett, distinguished guests, friends too many to name lest I overlook anyone...

It is nice to be back with my adopted community again. As I have said more than a few times in the past, it says a great deal about the Submarine Force that many years ago you were willing to make me a member of the family, especially since I started life as a surface warfare officer—and as an ASW officer at that!

Seriously, it is a privilege and an honor to be with this extraordinary group of professionals. I thank you, all of you, for what you do every day to defend this great nation of ours. I also want to thank your families, without whose support your jobs would be so much more difficult. And I want to congratulate all of the awardees—and their families—for the significant accomplishments for which they have been recognized over the last few days. As a former *Distinguished Civilian* honoree, I know what it means to be honored by the Naval Submarine League.

It's a particularly pertinent time to talk about naval power. Tomorrow is Trafalgar Day, the 206th anniversary of Admiral Lord Horatio Nelson's epic victory over the combined French and Spanish fleets in 1805, a victory which ensured Napoleon would never be able to mount an invasion of the United Kingdom. Now Horatio Nelson never saw a submarine, let alone a nuclear submarine. It's not clear he even knew about the first wartime use of a submarine, the attempted attacks by David Bushnell's TURTLE against ships of the Royal Navy during the American Revolution. But it is pretty clear that Nelson, a master strategist and master tactician, would have immediately appreciated the vast capabilities which nuclear submarines embody. He understood the need for fast ships to obtain vital intelligence. He understood the need for massive firepower. He understood the need for stealth. He understood the vital role sea power plays in defending the homeland.

Our Navy's Submarine Force plays a key role in each of these missions.

Let's begin with defending the homeland. Our SSBN force is the very backbone of the nation's strategic nuclear deterrent. In fact, it was the Ohio class SSBN with its Trident D-5 missiles which defeated Soviet nuclear strategy and helped bring the Cold War to an end.

Much has been said and written over the past several years to the effect that the nuclear deterrent is *yesterday's news*. The President has said it is his goal that nuclear weapons should be abolished some day. But it is certainly true that very few nations which currently deploy nuclear weapons share his ambitions.

Despite what the spin-doctors say, President Obama's Prague speech and vision of a world free of nuclear weapons has not had great resonance in the capitals of other nuclear weapons states, with the possible exception of some of the chattering class in London. Not in Paris. Certainly not in Moscow or Beijing. Not in Islamabad, or Tel Aviv, or New Delhi. And definitely not in Pyongyang—or in Tehran for that matter—each of whom will want nuclear weapons whether we have them or not in order to deter our conventional capabilities.

- In fact, in Moscow, policy moved to increase, rather than decrease, the role nuclear weapons play in its national security policy.
- It's pretty clear by now that Messrs. Putin/Medvedev place a very high reliance on nuclear weapons. In the same period of time that the United Kingdom and United States Administrations have been advocating reducing the role of nuclear weapons in their respective national strategies and eventually eliminating nuclear weapons altogether, here's what the Russian government has done:

  - publicly threatened nuclear use against their neighbors over the past three to four years, to include an exercise in the fall of 2009 which simulated nuclear weapons attacks against Poland;

  - authorized Russian strategic bombers to undertake repeated highly provocative flights near and into Japanese, British, US, and other NATO airspace,

  - allowed (and never contradicted) a senior Russian Defense Ministry spokesman announcing the development of a new hypersonic nuclear-armed cruise missile whose mission, aboard the soon-to-be-deployed attack submarine SEVERODVINSK, is to strike "aircraft carriers of the potential enemy;

  - threatened last December to begin a new nuclear arms race if the U.S. Senate failed to ratify the "New START" treaty;

As we meet here today, Russia is deploying a new generation of Inter-Continental Ballistic Missile, is contemplating building a second new type, is testing two new types of submarine launched ballistic missiles, and is building new strategic ballistic missile submarines. For the record, China is deploying two new types of ICBMs, is developing a new SLBM, and is the only one of the so-called P-5 nuclear weapons states which continues to increase its

nuclear arsenal. And Pakistan continues to build up its nuclear arsenal and is expected to soon have more nuclear warheads than the United Kingdom. **So much for the notion that if we and our allies demonstrate that we are intent on reducing the role our nuclear arsenals play other states will follow suit.**

So, nuclear weapons are going to play a considerable role in protecting the United States for a long time to come. This means we are going to need a modern, capable, SSBN force crewed by the finest officers and sailors in the world for a long time to come. The *New START* treaty doesn't alter this fact one bit. In fact, the Nation's reliance on the SSBN force is increasing. As indicated by the 2010 Nuclear Posture Review, the sea-based leg of the Triad will become increasingly important and relied upon to deliver a credible nuclear deterrent. When the treaty is fully implemented, the SSBN force will represent about **70%** of America's strategic nuclear warheads. The force will continue to be a significant hedge against technical failures in other legs of the Triad. And it will continue to be the only truly survivable leg of the Triad. But it is an aging force.

For the future, PEO Subs, Rear Admiral Dave Johnson and Director, SSP, Rear Admiral Terry Benedict, and their teams have been working together closely for some time to ensure that the follow-on to the Ohio SSBN similarly provides the United States the ability to deploy a strategic submarine force that's sized to meet the need. **But we need to get on with beginning to build the new boats. As the Ohio's retire, their successors must be available – in time – to replace them. We need a commitment from the Administration that this is going to happen.**

Furthermore, the D5 Strategic Weapons System (SWS) has been deployed on the OHIO Class SSBNs for more than 20 years, and is planned for a service life of more than 50 years. This is well beyond its design life of 25 years, and more than double the historical service life of any previous sea-based deterrent system. Significant additional sustainment efforts, including procurement of additional missile assets, will be required to sustain a credible and viable SLBM capability from now through end of life for the OHIO Replacement SSBNs in 2080. As the D5 SWS ages, sustaining demonstrated reliability and performance is expected to

become more challenging. The importance of high quality preventative and corrective maintenance continues even as supporting infrastructure ages, including facilities and unique support equipment, at the Strategic Weapons Facilities. Efforts are necessary to address operational support challenges and aging issues for the D5 SWS. The D5 SWS Life Extension (D5LE) program currently underway provides one-time component replacements for the guidance system and four missile electronics packages and procures additional missiles for flight testing to meet peak out load requirements in 2028 for the OHIO Class SSBNs. Continuous low rate procurement of Solid Rocket Motors (SRM) is in progress as a hedge against potential aging failures, and ultimately as replacements when existing motors reach the end of their design life. But many other components which are at risk for age related failure modes do not yet have replacement efforts planned or funded and in some cases lack stable industrial technology bases. A research and development (R&D) program must be initiated to develop alternative technologies to reduce mid-term risks and prepare to address long term program inventory shortfalls. Such a program should enable the development of affordable replacements integrating accessible materials, current technologies, and state of the art manufacturing capabilities at lower total ownership costs of the program going forward.

Make no mistake about it: the reason the possibility of nuclear war is so low is because of the massive firepower inherent in the survivable leg of our nuclear triad—our sea-based deterrent. It's at work every day.

Let me turn now to the SSN force. Where else can you find a military platform which gathers intelligence information which is invaluable, covers the gamut from strategic to tactical, and which the enemy doesn't even know is being collected? Where can you find a platform which can transform itself from intelligence-gatherer to war-fighter in an instant? Where else can you find a platform which combines these attributes with virtually limitless range and endurance? And which requires no forward support? The answer is simple: you can't! The modern attack submarine is truly a military marvel, matched only by the officers and men who man it.

As a global power, the United States must continue to be involved around the world. **We must be deployed forward.** And only naval forces can provide the requisite freedom of action and flexibility which our national interests require. Our naval forces will increase in relevance as the current ground wars wind down.

Within this broad context and framework, attack submarines, and I include SSGNs in that category, play and will continue to play, a key role in the influencing posture. They will, by virtue of their very existence, provide conventional regional and local deterrence; they will provide the ISR which regional and national commanders will need to make sound decisions; and armed with tomahawk cruise missiles, they deploy responsive and lethal firepower to implement those decisions if necessary. In addition, since our potential adversaries recognize what our shorter-range forces can do, they will seek to keep us as far away from their shores as possible. Anti-access strategies will become more and more prevalent. And there is no better weapon to defeat the anti-access strategy than our Submarine Force, stealthily gathering data on the enemy's deployments and then punching holes in their forces to allow the rest of America's capabilities to close in for action. But our enemies are not stupid. They also recognize this fact. They will increase their own ASW efforts and peer competitor Submarine Forces will grow.

But, against this backdrop of increasing undersea demands we must consider our shrinking US undersea forces.

- Execution of the current Program of Record (POR) will lead to a drop in the force level of about one third over the next 20 years.
- The attack Submarine Force will steadily shrink by 29 percent (from 55 to 39) over the next 20 years.
- Our forward deployed undersea presence will reduce by 43 percent over the same period, resulting from both a smaller SSN fleet and the retirement of all four OHIO-class SSGNs.
- This SSN and SSGN force structure reduction will also result in our undersea strike capacity shrinking by about 60 percent by 2030. With the prospect of reduced federal

resources in coming years will result in more budget cuts, the reduction in the undersea force may be even greater. The sharp contrast between the *growing future demand for undersea forces* and the presently *programmed decline in undersea forces* highlights the need for a carefully crafted undersea investment plan that identifies priorities.

Such a carefully crafted plan includes:

- Reducing the SSN shortfall by sustaining VIRGINIA procurement at two per year through 2025 and by extending the service life of selected Los Angeles-class SSNs
- Leveraging the successful VIRGINIA design and reducing risk during the construction of OHIO Replacement by building VIRGINIA SSNs beyond the currently planned 30 hulls
- Ensure sufficient weapons are available by resuming production of heavyweight torpedoes, incorporating modular design elements for cost control and future capability spirals and by adding extended range anti-ship cruise missiles to the SSN arsenal.

We also need to

- Reduce the imminent shortfall in undersea strike capacity and general purpose undersea payload volume by inserting a VIRGINIA Payload Module (VPM) with four large vertical tubes into 20 planned VIRGINIA-class SSNs starting no later than Block V
- Support the development of future conventional strike systems that are faster, more survivable and more capable than TLAM
- Introduce the ability to hold the emerging new set of fixed undersea targets at risk with either long-range undersea strike weapons or short-range capabilities where appropriate. In this regard, I absolutely disagree with the Administration's refusal to proceed with introducing a small number of conventionally-armed Trident D-5s into the force. It is a quick, easy, and affordable way to provide the

United States with an initial prompt global strike capability which we so badly need.

Finally, we need to provide a sustained undersea ability to insert, support and extract Special Forces.

All of this poses two special challenges. There is a challenge to all of you to continue to be the best submariners in the world. I am certain you are up to the task. And there is a challenge to those who support you—both inside and outside of government—to ensure that you have the best platforms and equipment in the world, and both of those in sufficient numbers. I hope we are up to that task. But I am certain the Naval Submarine League will be in the forefront of the fight to ensure you have all the support you need and deserve.

Thank you, and may God bless the United States of America and its magnificent Submarine Force.

TO THE SUBMARINE COMMUNITY

COMMENTS FROM THE SUBMARINE LEAGUE SYMPOSIUM

By VADM Al Burkhalter, USN(Ret)

President John Padgett very aptly described this year's Symposium as a meaningful update from the Submarine Navy leadership given betweeen two major addresses that were the *bookends* of the meeting which stressed the crucial issue of OHIO replacement. First, we heard Rich Meis's brilliant dissertation on the reasons against nuclear disarming and given from his perspective as the former CinC of STRATCOM. Then Frank Miller's excellent dinner address on Thursday night stressed the need to proceed with OHIO replacement on an urgent basis. (Both of their addresses appear elsewhere in this issue.)

The Submarine Navy leadership brought us up to date on the status of OHIO replacement planning and programming along with the status of the VIRGINIA Class program which begins construction of two ship per year. VA Class deliveries on, and frequently ahead of, schedule continues to be a highlight of Navy shipbuilding. Their message was loud and clear: each of us must do all we can to sustain the VA Class two per year build rate while focusing on OHIO replacement as a national priority.

The other highlight of the Symposium was the remarks Thursday evening by this year's Distinguished Submariner, Admiral Kin McKee. I had the privilege of introducing Kin as our Submarine Force leading *Top Gun* during the Cold War when he commanded DACE. His exploits provided knowledge of the Soviet navy's submarine development that was crucial to our own strategic planning and contributed to the eventual end of the cold War.

McKee's remarks stressed the submarine legacy that all of us inherited when we entered the force beginning with Submarine School. In his case, he was influenced by submarine veterans of World War II who taught him the basics followed by his CO's and shipmates who embellished that legacy. They clearly influenced the maturing of his submarine philosophy and eventually his

command presence. He was the only skipper awarded two Legions of Merit during his command.

In concluding, he reminded all of us of our obligation to keep that legacy alive and to pass it to our successors. BRAVO ZULU, KIN!!

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Mr. John H. MacKinnon
RADM Larry R. Marsh, USN(Ret)
CAPT Todd Meloy, USN(Ret)
ADM Richard W. Mies, USN(Ret)
In memory of VADM J. Guy Reynolds
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Mr. David W. Norman
VADM Ron Thunman, USN(Ret)

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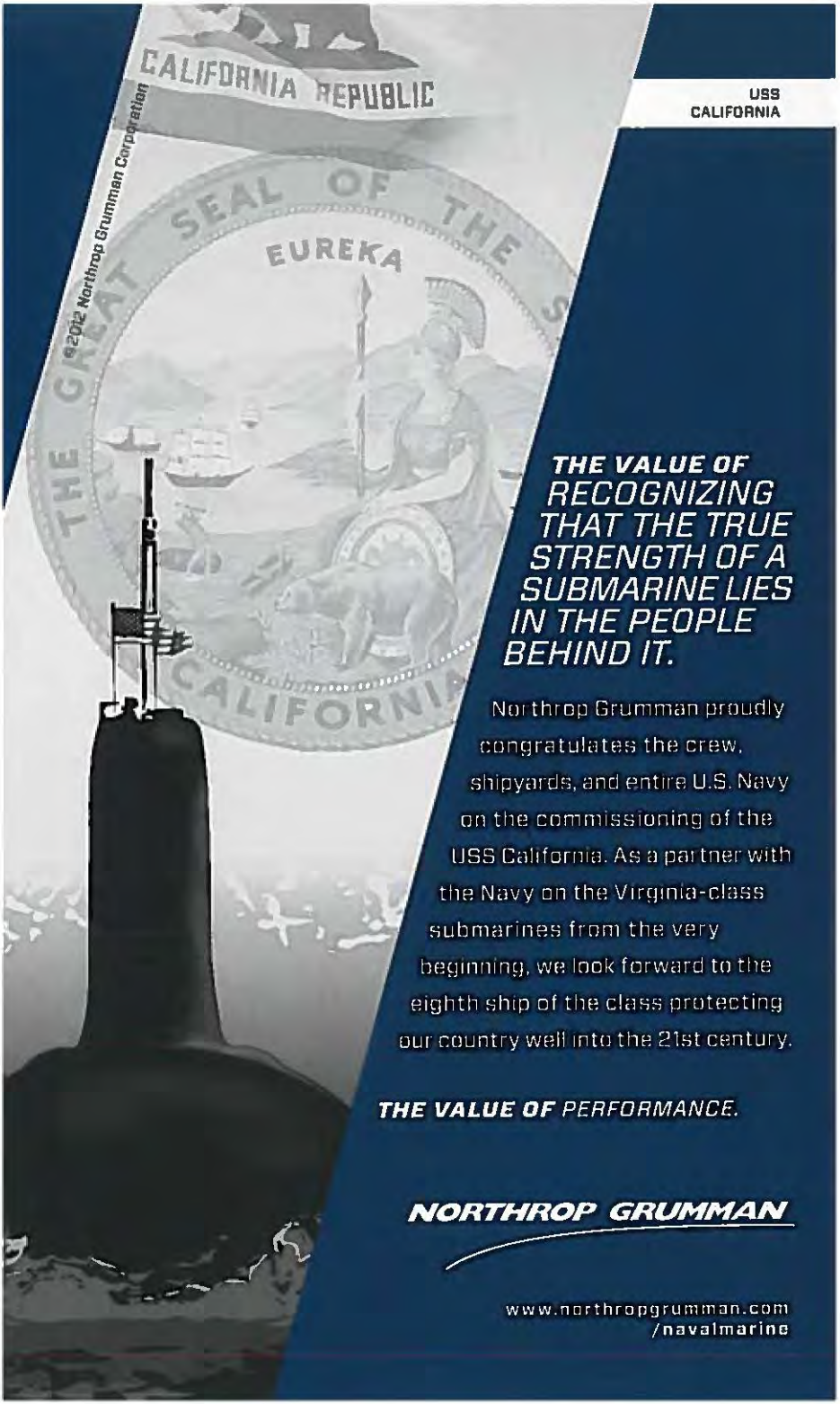

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COMSUBFOR OPEN LETTER TO THE SUBMARINE COMMUNITY

When the Design for Undersea Warfare (DUSW) was released, I stressed that it was a framework for action. I directed that everyone in the Submarine Force read it, think about it, discuss it and *act* on it. This direction was intended to engage the talent and creativity of our highly-skilled team of Submariners to achieve the goals laid out in the Design: to enable our nation to maintain undersea superiority now, and long into the future.

DUSW is intended to be specific enough to clearly define the objective, while being flexible enough to encourage initiative and boldness throughout the force—at all levels—in the attainment of these goals. As such, it has implications for major commanders, facility commanders, submarine commanding officers, and each of our officers and Sailors.

Main Objective: We will be masters of the undersea domain, able to achieve undersea superiority at the time and place of our choosing. We will be the experts for all matters in undersea warfare. Consistent with decades of past performance, our Undersea Force will apply itself along three main lines of effort:

- Ready Forces: Provide undersea forces ready for operations and warfighting
- Effective Employment: Conduct effective forward operations and warfighting
- Future Force Capabilities: Prepare for future operations and warfighting

I encourage you to visit
http://www.public.navy.mil/subfor/hq/PDF/Undersea%20Warfare.pdf to see the "Design for Undersea Warfare: and
http://www.public.navy.mil/subfor/hq/PDF/Undersea%20Warfighting.pdf
to view the companion publication, "Undersea Warfighting."

This document defines our way forward in a complex and often unpredictable environment. As such, it will evolve—it is not a rigid plan. To ensure that necessary changes can occur, the Design for Undersea Warfare has assessment and learning built in—we will make changes as necessary and continue updating our assessment as we learn.

The great thing about the Design for Undersea Warfare is that it is flexible, adaptive, and all about the Submariner.

Semper Procinctum
VADM John M. Richardson, USN

DESIGN FOR UNDERSEA WARFARE
JULY 2011

The work of our Undersea Force is complex, dynamic and vital to national security. With a community as broad and diverse as ours, it is important for us to have a shared sense of our main objectives, and to align our efforts to achieve them. The Design for Undersea Warfare serves these purposes.

The Design for Undersea Warfare is intended to be specific enough to clearly define the objective, while being flexible enough to encourage initiative and boldness throughout the force—at all levels—in the attainment of these goals. As such, it has implications for major commanders, facility commanders, submarine commanding officers, and each of our officers and Sailors.

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- **Ready Forces:** Provide undersea forces ready for operations and warfighting
- **Effective Employment:** Conduct effective forward operations and warfighting
- **Future Force Capabilities:** Prepare for future operations and warfighting

It is difficult to separate warfighting from peacetime operations, as they are so closely related. Our undersea forces conduct peacetime operations to prevent war, by deterring and dissuading our adversaries and by assuring our Allies and partners. Peacetime operations further serve to help us understand and shape the battlespace, and to learn the capabilities of potential adversaries. Our goal is that, by virtue of our robust and focused operations, we will clearly be ready to prevail in any conflict. The warfighting readiness and effectiveness of our Undersea Force

should serve to compel potential aggressors to choose peace rather than war, restraint rather than escalation, and termination rather than continuation.

Enduring Attributes: What has not changed is that the success of our undersea forces depends on dedicated, technically skilled and engaged warriors.

Areas for Greater Emphasis: There are a number of long-term national security trends that interact to make undersea operations and warfighting capability increasingly important. In light of this, you will find several Focus Areas singled out for renewed dedication within our force. First, there is increased emphasis on the development and certification of relevant warfighting skills at the unit level, at the tactical and operational commander level, at the strategic level, and at supporting commands. Next, you will find increased emphasis on creativity and innovation, sparked by initiative and a heightened sense of authority, responsibility, and accountability at the lowest capable level—even to the individual.

This document defines our way forward in a complex and often unpredictable environment. As such, it will evolve it is not a rigid plan. To ensure that necessary changes can occur, the Design for Undersea Warfare has assessment and learning built in—we will make changes as necessary.

The Design for Undersea Warfare is a framework for action. Read it, think about it, discuss it and act on it.

R. P. BRECKENRIDGE
Director Submarine Warfare Division

J. F. CALDWELL, JR.
Submarine Force U.S. Pacific Fleet

J. M. RICHARDSON
Commander Submarine Force

PART I CONTEXT FOR THE DESIGN

Assumptions about the world, key trends, threats

1. A **chaotic and disorderly global security environment** will increase demands on the U.S. Navy and U.S. Undersea Forces.
2. **Globally proliferating submarines** are increasing pressure on freedom of the seas and contesting our undersea superiority.
3. **Anti-access, Area Denial (A2/AD) systems** challenge our surface and air forces, placing increased responsibility on our undersea forces to enable Assured Access for the Joint Force.
4. **America's vital undersea infrastructure** (energy and information) is becoming even more critical and more vulnerable.
5. **Our shrinking Submarine Force size** requires that each platform individually must support more requirements across a broader area.
6. **Deterrence provided by our stealthy, agile, persistent and lethal submarines** (SSBNs, SSNs and SSGNs) will remain important against both state and non-state actors.
7. **Ubiquitous media presence** means we will need to exploit our concealment to provide our leadership options by remaining undetected and non-provocative when desired.
8. **The expanded decision space that undersea forces provide** will be increasingly valued by senior leadership as the security environment grows in complexity, leading to increased requests for undersea support.

Assumptions about the future

1. **The operational environment will become more complex,** further stressing the human element in undersea operations and warfighting.
2. **Adaptive, determined and tenacious adversaries will exploit** our weaknesses with little or no notice.
3. **Survivable U.S. SSBNs will provide nuclear deterrence** for the United States and many of our allies for the foreseeable future.
4. **Combatant Commanders will continue to value** the unique capabilities and conventional deterrence that SSNs and SSGNs deliver.

5. Unmanned underwater system technology will advance with increased endurance and capability.
6. We will need to fight our *Virtual Ship* in the cyber domain as capably as we fight in the undersea domain. We must protect our information and our systems from attack and take the fight to the enemy.
7. Available financial resources will decrease due to budget pressures.

Expectations Others Have of Our Navy and Undersea Forces:

We will be expected to achieve undersea superiority at the time and place of our choosing.
1. We will use the Navy to gain access despite diplomatic, geographic, and military impediments. (CNO)
2. We will build appropriate Navy force structure and provide it with an appropriate strategic lay-down. (CNO)
3. We will provide forces ready for tasking to Combatant Commanders. (USFF)
4. We will sustain our forces through their Expected Service Life. (USFF)
5. We will reduce Fleet overhead and fund deployable units at a higher priority than everything else. (USFF)
6. We will win wars, deter wars, defeat terrorists, and ease disasters with our Maritime Forces (Cooperative Strategy for 21st Century Sea Power)(CS-21)
7. We will secure the US from attack; secure strategic access and retain global freedom of action. (CS-21)
8. We will provide persistently present, combat-ready Maritime forces capable of forcible entry and quick response to other crises. (CS- 21)
9. We will impose local sea control wherever necessary—by ourselves if we must. (CS-21)
10. We will maintain nuclear weapons safety and security.
11. We will maintain nuclear reactor safety and security.
12. We will maintain security of classified material and information systems.

Priorities – Enabling Success and Managing Risk

1. Peacetime Operational Priorities:

Safety: Our operational responsibilities hinge first and foremost on enforcing the highest standards of safety, including the prevention of collision, grounding, serious injury or death.

Stealth: Safety is closely followed by a commitment to remaining undetected as we execute highly sensitive missions in support of our Nation's security. We must prevent counter detection, compromise of mission details, or exploitation of our sensitive classified information.

Mission Aim: Mission accomplishment within the bounds of safety and stealth is our highest priority

2. Professional Behavior: We must embody the highest standards of character. At sea, we will conduct ourselves as proud warriors, worthy of bearing arms in the defense of our nation. Ashore, we will be ambassadors of the Nation and the Navy, preventing liberty or public incidents at home or abroad. The Commanding Officer must set a powerful example.

What We Must Do: Forces that Support Our Efforts

Our people are the key to our success. The shared *Submarine Culture* running through our undersea community is our strongest supporting force. It provides us with our warfighting focus and our operational readiness. It must NEVER be compromised.

Alignment: Our value as a Force is significantly enhanced when we maintain a coherent alignment amongst our senior leadership and with each other. We must ensure we remain consistent both with our broader strategic responsibilities to the Navy and with the other elements of the Undersea Force.

Warfighting:

We expect to operate and fight far forward, independently, *behind enemy lines*, for long periods of time, without support

We maintain ourselves as ready as possible to leave soon, move quickly and be among the first to penetrate the enemy's defenses

We know our potential adversaries and have operating experience in the environments that might become future undersea battlegrounds

We exploit concealment by the sea as a key to our success, but we respect that the same sea will kill us unless we hold it at bay

We depend on stealth, surprise and boldness and practice these every day. We safeguard tactical information and avoid exploitable patterns

We understand that operating undersea is inherently a dangerous business and that only trained and vigilant individuals and teams will keep our ships and crews safe

We understand *calculated risk* but avoid *unnecessary risk* by thinking ahead, anticipating risk and taking mitigating actions

Readiness:

We stay ready to operate far forward on short notice by managing manpower, training and maintenance to avoid fluctuating readiness

Our people are the backbone of our success. Submariners are national treasures

We have small crews. Each person has multiple roles. All are responsible for the ship's safety, stealth and mission

We depend on initiative, de-centralized command and teamwork

We depend on absolute integrity. We employ back-up and second checks, but each person remains individually responsible

We comply with procedures, founded on technical understanding We know and use the source requirements and references

We have no peer in our aggressive approach to improvement through assessment and training

We candidly face the facts – good and bad – and proceed based on well-known standards that are based on thorough analysis

We ensure nobody is indispensible by building depth of expertise We incorporate safety and effective work practices into our habits

We are resourceful. We always have a Plan B, and we can often

fix the equipment even if we lack the parts

We own our ships, taking meticulous care to maintain them in a state of maximum possible material readiness – ready to go to war

What We Must Avoid: Forces that Work Against Us

1. Our current **approach to inspections and assessments rewards cyclic and temporary narrow excellence** instead of excellence which is sustained and broad.

2. **Our TYCOM and ISIC efforts tend to limit a Commanding Officer's freedom and flexibility**. Shared responsibility and accountability between the ship and the chain of command is limiting CO's ability to achieve success. Excessive administrative distractions are burdensome.

3. **We lose sight of the fact that warfare is a human-centric problem. Insufficient emphasis is given to developing creativity and initiative,** both of which are essential to the practice of de-centralized command upon which effective undersea warfare is based.

4. Our solutions to problems can **tend towards bureaucratic, process-dominated approaches.**

PART II
SUMMARY OF THE DESIGN FOR UNDERSEA WARFARE

Three Lines of Effort with Associated Focus Areas

Our undersea force has long approached its responsibilities for securing national security along three Lines of Effort (LOEs), depicted in Figure 1. The Design for Undersea Warfare also identifies associated *Focus Areas*, which describe the *emphasis* required within each LOE.

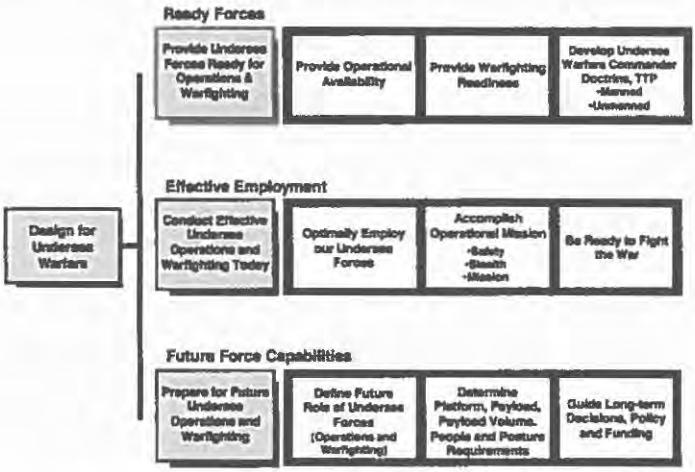

Figure 1 – Design for Undersea Warfare Lines of Effort

Each of the three Lines of Effort has associated Focus Areas:

Ready Forces—Provide Undersea Forces Ready for Operations and Warfighting:

This captures our responsibility to prepare undersea forces for scheduled or emergent deployments as well as warfighting. The time horizon for this Line of Effort is roughly five years.

Focus Areas:

Enhance CO initiative and character, including the responsibility, authority, and accountability to prepare the ship for operations and warfighting; structure the relationship with Squadrons, Groups and Type Commanders to shift the responsibility for preparation, planning, execution, assessment and improvement more to the ship. Maximize CO effectiveness by nurturing character and integrity at every opportunity.

Sustain warfighting readiness during the inter-deployment period; adjust the interaction within the chain of command to reward stable, broad excellence vice short-term, cyclic pulses; return tactical initiative to the operating forces

Develop Undersea Warfare Commander Doctrine and TTP; integrated C2 for both manned and unmanned undersea systems; practices for effective coordination of mixed undersea forces with other forces

Effective Employment—Conduct Effective Undersea Operations and Warfighting: This captures our responsibility to work with operational commanders to be ready to establish undersea superiority at the time and place of our choosing. Effectively employ undersea forces to reliably and professionally deliver the operational and warfighting performance expected by the Combatant Commanders. The time horizon for this Line of Effort is roughly five years.

Focus Areas:
Active engagement with Fleet and Operational Commanders to **develop coordinated theater specific campaign plans** that optimally employ our undersea forces; enhance development of innovative strategic and tactical employment of undersea forces (e.g., C7F Submarine Campaign Plan and supporting CSP Submarine Response Plan); tighten our assessment processes with Operational Commanders and supporting players to make us more effective warfighters.

Increase the **deliberate and planned demonstration of warfighting capabilities** and access at the submarine and force level enhancing confidence in our abilities and systematically proving we can do what's required; lead in development of Theater USW Doctrine and teamwork; improve Mission Assurance to ensure we can fight through a range of C4I challenges in peacetime and war. **Improve operational availability of undersea forces** while forward (through improved resilience, achieve better reliability, on-board repair, in-theater repair)

Future Force Capabilities—Prepare for Future Undersea Operations and Warfighting: This defines the future role of undersea forces, the associated requirements for platforms,

payloads, manpower and operations, and the decisions, policies and resourcing required. The time horizon for this Line of Effort is roughly five years and beyond

Focus Areas:
Develop an **integrated approach to future undersea capabilities** that coordinates platform, payload volume, payload, people and force posture plans; link the plan to required near term decisions or investments; take necessary actions to evolve tactical security in the face of anticipated threat improvements

Outline the strategy to **continue to access, train, and retain the very best people that will fill our ranks.** This will require creative approaches to find and attract the best and the brightest that the nation has to offer—people of character and integrity, technically skilled, with personal and leadership abilities.

Define the **future role of undersea forces** to make best use of undersea concealment for national security, incorporating hedging strategies to accommodate uncertainty in global trends, technology and adversary's capability and intent

Obtain **SSBN, SSGN, SSN and Payload decisions** to address SSBN requirements, SSGN replacement, the SSN force structure shortfall, and emergent payload requirements

PART III
DETAILED DISCUSSION OF EACH LINE OF EFFORT

Ready Forces:
Providing Undersea Forces Ready for Operations and Warfighting

Goals

1. Prepare undersea forces to safely and effectively complete peacetime operations directed by operational commanders. These operations will also support warfighting effectiveness.
2. Prepare undersea forces to effectively conduct wartime

operations on short notice as directed by operational commanders.

3. Develop and refine, through experimentation, the command and control doctrine and TTP for the Undersea Warfare Commander for manned and unmanned systems.

In reaching these goals, our process must **certify that the quality** of provided forces meets standards. Furthermore, the process must be **sustainable.** It must not depend on shifting material and manpower excessively from one submarine to another in order to meet short-term commitments.

Ready Forces: Focus Areas for Increased Emphasis

Enhance CO initiative and character, responsibility, authority, and accountability to prepare the ship for operations and warfighting; structure the relationship with squadrons, groups and type commanders to shift the center of gravity for preparation, planning, execution, assessment and certification more to the ship; emphasize CO ability to distinguish acceptable risk from undue risk. Enhance CO effectiveness by nurturing integrity and a strong character at every opportunity.

Adopt a culture of sustained warfighting readiness during the inter-deployment period; adjust the interaction within the chain of command to reward stable, broad excellence vice short-term, cyclic pulses; return tactical initiative to the operating forces. *Mindset: "This is the last week of peace before going to war."*

Develop Undersea Warfare Commander Doctrine and TTP; integrated C2 for both manned and unmanned undersea systems; practices for effective coordination of mixed undersea forces with other forces.

Ready Forces: Detailed Application of the Focus Areas

1. Personnel Readiness: Improve the accession, training, and retention of our people. This will be done through Systematic Rating Deep Dives (FIT), Unplanned Losses (UPLs) Deep Dive, follow-up on Engineering Department Master Chief (EDMC)

community corrective actions. Enhance Sailor and Family resiliency with a systematic approach to preparing our Sailors and their families for submarine duty responsibilities. Improve the effectiveness of the officer career training pipeline, providing a more coherent, career approach towards developing a submarine Commanding Officer—including more deliberate emphasis on the developmental role of sea tours.

2. Fleet Readiness and Training Plan (FRTP): Revise the FRTP to increase the amount of time available for the ship's Commanding Officer and ISIC to effectively train their crews. Lengthen FRTP underway periods to increase stable, at-sea training time. Increase CO latitude in tailoring submarine schedules.

3. Training: Update the Continuing Training Manual (CTM) and Continuing Training Support System (CTSS) to provide COs more useful assistance on how to build a successful training program. (Examples: better planning tools, Force Exam Bank use, alignment of qualification and training, and better tracking in CTSS). While maintaining the predominantly human element in training, consider approaches to *distance support* for training, particularly in examinations. Establishing a predominantly watch-team approach to operational training.

4. Assessment: Provide an instruction that describes assessment as a means for improvement. Shift the emphasis from external (ISIC) *exam workups* in support of *snapshot* assessments, to developing and evaluating a submarine crew's ability to assess itself, correct and improve itself, and establish a mindset of sustained, broad superior performance. Adjust engagement at the ship, ISIC and TYCOM levels to focus on developing the mindset and behaviors for sustained performance, while shifting the center of gravity for assessment and improvement to the submarine and CO. As a supporting action, achieve a more *steady strain* approach to readiness by considering more unscheduled exams (e.g. TREs and ORSEs). Ensure that exams include an assessment of the *sustaining* mindset and behaviors on board the submarine.

5. Maintenance/Materiel: As we have throughout our history, we will set and achieve uncompromising standards of material readiness—our environment demands nothing less.

Intermediate Maintenance: Reduce lost operating days and degraded readiness due to maintenance schedule overruns by optimizing the planning and scheduling of maintenance periods within the FRTP and during refits. Manage transitions (first/last 100 hours) more tightly, emphasize planning, strict control of growth/new work and adherence to key events schedule.

Depot Maintenance: Control duration and cost by better planning and transition management. Work with NAVSEA to shorten SSBN ERO duration. Manage depot maintenance transition with rigor similar to deploying a ship. Forecast work package requirements via more accurate Technical Foundation Papers to enable proper Shipyard loading and resourcing. Work with NAVSEA to establish better execution and planning metrics.

Modernization: Focus modernization efforts to more concisely address improved human-systems interfaces and reduced training burdens while improving the capabilities and reliability of key sensors such as towed arrays and photonics masts. Better balance operational requirements, fiscal realities, and sustainability in the COTS strategy.

Supply: Improve sustainment and reduce cannibalization by better supply support (particularly Virginia class) and proactive management of onboard and off hull supply parts with NAVSEA and NAVSUP partners.

6. Develop Undersea Warfare Commander Doctrine: Formalize standardized doctrine and procedures for coordinating the operations and effects of the full range of undersea systems with special emphasis on incorporating unmanned undersea systems into broad Navy operations. Anticipate emerging changes in communications, networking and autonomous operations to keep TTP current.

Effective Employment:
Conducting Effective Undersea Operations and Warfighting Today

Goals

1. Optimally employ our undersea forces independently or as part of a team in support of our operational or warfighting responsibilities.

2. Reliably and professionally accomplish the missions tasked by the operational commanders while effectively managing risk and stealth.

3. Upon direction, go to war and immediately execute the combatant commanders' direction.

This objective is about establishing undersea superiority at the time and place of our choosing through the optimum employment of undersea forces. It involves every element from the deliberate advanced planning of forward operations and SSBN patrols to the conduct of combat operations.

Effective Employment: Focus Areas for increased emphasis

Active engagement with Fleet and Operational Commanders to **develop coordinated theater specific campaign plans** that optimally employ our undersea forces; enhance development of innovative strategic and tactical employment of undersea forces (e.g., C7F Submarine Campaign Plan and supporting CSP Submarine Response Plan); tighten our assessment processes with Operational Commanders and supporting players to make us more effective warfighters.

Increase the **deliberate and planned demonstration of warfighting capabilities** and access at the submarine and force level enhancing confidence in our abilities and systematically proving we can do what's required; lead in development of Theater USW Doctrine and teamwork; improve Mission Assurance to ensure we can fight through a range of C4I challenges in peacetime and war. **Improve operational availabil-**

ity of undersea forces while forward (through improved resilience, achieve better reliability, on-board repair, in-theater repair).

Effective Employment: Detailed Application of the Focus Areas

1. Theater Specific Employment Planning—Submarine Campaign Plans:

Formally coordinate and proactively engage Fleet and Operational commanders to thoroughly understand theater OPLANs, required capabilities (including access) and gaps. Encourage creative employment of submarines and undersea assets to conduct forward operations that improve our warfighting readiness and take advantage of our full range of capabilities (e.g., SSGN). Working closely with operational commanders, build a multi-year employment plan and theater-specific Submarine Campaign Plans. By necessity, plans must include solutions to warfighting in communications degraded environments. Integrate innovative demonstrations of undersea force employment or warfighting capabilities into deployments. Integrate capability development into the preparation of Ready Forces.

2. Operating Our Ships—Developing Confidence and Demonstrating Operational and Warfighting Excellence:

Exploit opportunities to enable COs and crews to operate in anticipated wartime areas, walk the battlefield, prove access and demonstrate warfighting skills and postures (e.g., operations in degraded C2/GPS, operational agility, application of wartime ROE, in-theater torpedo firings, SSBN patrols uninterrupted by *Brief Stops*, etc). Systematically test and evolve guidance based on lessons learned and experience gained. Conduct entire deployments or patrols at heightened stealth postures; assess stealth in-situ with short notice planned events (e.g., P3, SECEX). Exploit real world and exercise opportunities to incorporate unmanned systems (aerial and underwater) into forward operations and warfighting demonstrations. Provide feedback to help evolve USW Commander Doctrine and better leverage the capabilities of our undersea platforms and supporting forces. Include COs in the

development of operational orders including proposed tasking, identification of best practices and pitfalls, and required mission rehearsals. Increase attention to *calculated risk* versus *undue risk*.

3. Sustaining Our Advantage—Forward Materiel Availability: Sustain the availability of essential systems in forward areas by improved reliability, logistic support, at-sea repair capacity and back-up/redundant modes of operation. Increase expected availability of tenders in Phase 0 and wartime. Submarine sensors, antennas, DSE support equipment, fire control and weapons require improved forward availability, as does IUSS-related equipment. Improve forward ordnance availability. Demonstrate warfighting support such as in-theater reloading, at-sea resupply, remote site maintenance and other required skills.

4. Sustaining the Fight—Mission Assurance: Ensure our readiness to support the Operational Commander throughout a range of C4I challenges in peacetime and war. Build on existing collaboration and coordination between Submarine Operating Authorities to ensure seamless undersea support to the warfighter. Review, assess, and improve Continuity of Operations Plans.

5. Assessing Our Performance—Feedback to Make Us Better: Establish tighter feedback to the submarine preparation process from operational commanders, other forces and the intelligence community regarding forward operations. Formally assess training doctrine, tactical development, tactical security, modernization plans, concepts of operation, system performance, and forward maintenance practices. Scrutinize Tier 2/3 events and formalize lessons-learned. Assess likely future warfighting environments and determine what is necessary for success and make the necessary adjustments across the Force.

Future Force Capabilities:
Preparing for Future Undersea Operations and Warfighting

Goals

1. Define the future role of undersea forces in both operations and warfighting.

2. Determine platform, payload, payload volume, people and posture requirements.

3. Coordinate future missions with other warfare communities.

4. Translate requirements into decisions, policy and funding.

This area of effort deals with the future beyond the next five years and must take into consideration uncertainty about future projections. There are, however, some factors that can be reliably foreseen: by the existing program of record, the number of nuclear submarines will shrink by about 30 percent over the next 20 years. By 2030, our forward presence will decline by more than 40 percent and our undersea strike capacity will drop by almost 60 percent. Despite these trends, there is every reason to believe that the future of naval warfare will place increasing, and not decreasing demands on undersea forces. This divergence of resources and demands places ever greater stress on the importance of an integrated approach for our future undersea capability development.

Future Force Capabilities: Focus Areas for Increased Emphasis

Define the **future role of undersea forces** to make best use of undersea concealment for national security, incorporating hedging strategies to accommodate uncertainty in global trends, technologies and adversaries

Develop an **Integrated Undersea Future Strategy** to align requirements for platforms, payloads, payload volume, people, and force posture

Obtain **SSBN, SSGN, SSN and Payload decisions** to address SSBN requirements, SSGN replacement, the SSN force structure shortfall, and emergent payload requirements

Future Force Capabilities: Detailed Application of the Focus Areas

1. Future Role of Undersea Forces—Long Term Undersea Warfighting Vision: Create a clear and broadly accepted vision of the growing importance of undersea forces in a future with increasing anti-access area-denial (A2AD) systems. Refine Navy and Joint Force understanding of the importance of undersea concealment to maritime military success. Advocate the implementation of the *Concept for Leveraging the Undersea Environment*. Highlight the distinction between A2AD *defense, penetration* and *defeat*.

2. Future Payload, Platform, Payload Volume, People and Posture—Integrated Undersea Future Strategy: Platforms: Determine requirements for OHIO Replacement SSBN and its impact on SSGN replacement. Determine requirements for SSGN replacement and implications on SSBNs and SSNs. Determine approach for dealing with the SSN shortfall after 2024 and how that impacts SSGN replacement options.

Payload Volume: Consider the merits of the Virginia Payload Module to replace lost payload volume (distributed vs. concentrated firepower). Plan to simplify payload interfaces.

Payloads: Enhance the military utility of existing payloads through incremental evolutionary changes without needing new programs. Plan to resume torpedo production. Determine new payloads required and their impact on payload volume needs. Consider future sonar system requirements. Conduct liaison with SOCOM to determine the way ahead for SOF payloads. Align payloads with evolving tactical security needs.

People: Determine system and payload changes (sonar, fire control, software, etc.) to enable reduced manning. Identify means to promote increased operational efficiency. Anticipate and define necessary new skill sets, then determine how best to recruit, train and retain them.

Posture: Identify the implications to future operations given different force levels, payloads, basing and manning schemes.

Determine how best to operationally integrate diverse undersea systems, including UUVs, in the future. Refine the mission area of subsea warfare and the systems/operations needed to carry it out.

3. Long-term decisions, policies and funding—SSBN, SSGN, SSN and Payload decisions:

SSBN: Attain decisions on the OHIO Replacement capabilities, including stealth, survivability, and sustainment model. Ensure long-term continuity of sea-based strategic deterrence.

SSGN: Attain decisions on replacement of SSGN capacity when SSGNs retire, including Virginia Payload Module R&D and procurement funding.

SSN: Attain and sustain two-per-year procurement of Virginia-class SSNs. Gain support for extending the life of selected SSNs to help fill the SSN shortfall without impacting the plan for SSN replacement. Defer the *New SSN* while continuing procurement of additional Blocks of VA-class SSNs with associated incremental enhancements until after completion of OHIO Replacement class procurement.

Payloads: Encourage the development of undersea payloads by other resource sponsors, including Conventional Prompt Global Strike (OSD), Large Displacement Unmanned Undersea Vehicles (LDUUV)(N2/N6), next generation SOF vehicles (SOCOM), and Distributed Netted Systems.

ARTICLES

SUBMARINES IN AN ERA OF AUSTERITY

Jan Kallberg, PhD

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"A lot of people don't like realists. Realists face the world as it is. Most people want the world to be nicer and for people to be better."

—Kenneth N Waltz

SUBMARINES KEY COMPONENT

The federal debt will impact our national security; it was clearly stated by Admiral Mike Mullen when the Chairman of the Joint Chiefs of Staff said, during his August 2010 Conversations with the Country tour, that the federal debt is a national security threat. If not addressed properly, it limits the country's security options.

The national debt will force the United States in the coming decades to suffer unprecedented reductions in military power, redesign the mix of systems available for military operations, and accept a new geopolitical posture. It is logical that the United States prioritize nuclear submarines and submarines, in general; the reasoning is straight forward. The submarine is a versatile platform that maintains deterrence, patrols the seas, and projects power without disclosing its numbers or location. Depending on political climate and how austerity measures reduce the deficit, there are several national security positions that can serve as the new paradigm a few decades from now. When America retracts and reduces its military might to the American homeland, it works in favor of the submarine fleet since the doctrine relies increasingly on submarine capability.

DEFENDING THE HOMELAND

The country enjoys geopolitical advantages; the Pacific and Atlantic oceans are two bodies of water that protect the country from a variety of conventional military threats. Naturally, submariners are well aware of vast oceans, but others forget that the country is protected by these oceans. In comparison to other nations, the country is safe geopolitically. The United States is not foreign to isolationism, the primary position from the founding of the nation to December 7, 1941; World War I was a temporary change of position. Isolationism can occur without a nation being detached entirely from geopolitical maneuvering, but the focus is protecting the homeland and actions are taken only when attacked or major interests are threatened. Isolationism affects the army since the concept is to defend America; with significant oceans on either side, a land invasion is unlikely.

International peacekeeping cooperation requires an expeditionary ground force, likely the Marines. It is questionable if peacekeeping missions predominant in the last two decades will continue at the same pace and magnitude. The first question we have to answer is: have earlier missions been successful? The second question comes naturally: can we afford it? Under the umbrella of NATO or UN, the U.S. component in any peacekeeping or peace-enforcing mission will not be as substantial as earlier operations because global operations are costly.

EVERYTHING ON THE TABLE

When I started to write this article, a quote by Henry Kissinger came to my mind: The absence of alternatives clears the mind marvelously. My intent is to portray the implications of continued budget stress in the federal government, and visualize the opportunity of the submarine fleet in an era of radical defense downsizing.

After an era of endless defense money—as Robert Gates called the years after 9-11—there are some tough decisions to make. Depending on whether you count Veteran Affairs, Department of Energy's maintenance of the nuclear arsenal, the extra ordinary cost for operations in Iraq and Afghanistan, and

other defense-related costs not presented in the actual defense budget, about $600 to $850 billion are spent on defense; this will not continue as it becomes impossible to finance in the federal budget. Initial actions remove waste and redundancy but these will not have a large impact on the budget as tangible and deep reductions. We have to ask ourselves basic questions: should the United States support three air forces—Navy, Marines, and Air Force—or should these units consolidate? Does the United States need a presence in foreign countries? Are VA hospitals and Medicare redundant? Why does not one system for Medicare and VA healthcare suffice when the federal budget pays for both systems?

Intra-departmental budget wars are as furious as any military campaign, and resemble a civil war with few loyalties and no mercy; we have a hard time predicting the outcome since the issue is colored by institutional perceptions of reality, biasness, and is fought all the way down to pork-spending politics. The world arrives where logic resides, after taking a few detours. A logical standpoint is that an isolationistic posture benefits services other than the Army and Air Force. If the deficit is $1.6 trillion, federal credit rating is lowered and Congress finds it difficult to balance the budget; the Air Force does not get the last F-35 of the 1,763 ordered. It becomes politically impossible to prioritize the last ordered 1,763rd F-35 before Section 8 housing, Veterans benefits, food stamps, and Social Security.

THE DO-NOTHING OPTION

There is always the option to do nothing; it could last for a number of years with marginal reductions in federal spending, and the debt continues to increase. Eventually the halt is far more brutal and financially unsound since we are forced to send newly-commissioned hardware and assets to the scrap yard because we cannot afford to man, operate, and maintain these assets. Doing nothing is inviting; it feeds our status quo biases, but the deficit and the debt are numbers that do not go away. Denial is not an option.

Once the United States stops to plan for a major overseas land war, there is no longer a need for strategic sea transport capacity, nine air carrier task forces that support the mission and offer air superiority, and a variety of land warfare systems. Budgetary survivors in an isolationist scenario include the Marines and the submarine fleet. Less fortunate is the surface corps, and there would be significant reductions in the Air Force and Army. As an isolationist nation, the Army can be reduced to a few upholding units and a cadre of reserve and National Guard units that can be mobilized within several months. The Army plays a limited role, if any, in the isolationist scenario. The limited role of ground fighting units works in favor of the Marines since they are more versatile than regular army units. Under isolationism, a defense budget could shrink to as low as $250 to $300 billion or less, with an absolute minimum of foreign bases and engagements. Once the Armed Forces reach these low budgetary levels, nuclear arms and submarines become key components to maintain not only deterrence, but power projection.

RENAISSANCE FOR NUCLEAR DETERRENCE

In the coming decades, nuclear arms play a more central role in comparison to the first decades of the 21st century. Nuclear arms are the only weapons that project power from Spitsbergen to Polynesia simultaneously, without moving military hardware or personnel. Political theorist Kenneth N. Waltz argued that **the power of nuclear arms lies in not what you do with them; it is what you can do.** *(Ed. Note: Emphasis added)* Under severe budgetary pressure, nuclear arms maintain the nation as a major power. This reasoning made the United Kingdom prioritize submarines with nuclear arms, even after the deepest contemporary defense cuts. Reliance on nuclear arms to maintain geopolitical equilibrium is visible in Siberia and the Far East where a resource-rich wilderness borders China. Russia's ability to defend and uphold the territorial sovereignty of Russia's Far East relies heavily on nuclear arms. Nuclear arms return as tools of power incrementally.

Austerity and extensive defense budget cuts trigger renewed interest in the nuclear ballistic missile submarine; the reason is

simple, it is cheap in comparison with other forms of power projection and ability. The ticket price is high, though, because they are expensive to operate, but a nuclear submarine projects power beyond the force any armored division or army corps could ever achieve; the submarine projects power globally in real time 24/7/365. The nuclear submarine—considered expensive and unimportant after the Cold War—rises in interest; a combination of surface corps, submarines, space technologies, and intelligence becomes the pillar of a homeland-oriented defense strategy. The nuclear doctrine adopted by the current administration is likely to change since nuclear arms and embedded geopolitical power cannot be replaced by conventional forces; these forces are too expensive. Instead, the movement reverses and nuclear arms replace conventional forces to project American power. If necessary, the isolationist doctrine is ready to scale up, but peacetime operational military machinery is limited to intelligence, deterrence, and an ability to intercept sea, air, and space operations directed toward the homeland. The federal debt and a radical downsizing of U.S. military power are likely to increase the importance of the submarine fleet, based on its versatility and in combination with nuclear arms.

OPERATION FORAGER

by Mr. Sherwood R. Zimmerman

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By May 1944, General Douglas MacArthur, U.S. Army, and his Southwest Pacific Forces had driven westward along the northern coast of New Guinea to the island of Wake, in preparation for the next step, the invasion of Biak. Admiral Raymond A. Spruance, U.S. Navy, in command of the Fifth Fleet, had completed Operation Desecrate on 30 March and, with a carrier air raid on the Palau Island ended, plans were laid to thrust the sword of sea power deep into the underbelly of the Japanese Empire.

Meanwhile, Admiral Soemu Toyoda, Commander-in-Chief of the Japanese Combined Fleet, was preparing for quite a different type of operation. The Japanese Empire had been pushed back to a line joining Biak to the Carolines, Marianas, and home islands. Toyoda realized that an attack on this perimeter was imminent, but was determined to hold the line at all costs. A confrontation of enemy fleets was, therefore, unavoidable; it resulted in the Battle of the Philippine Sea.

Before this battle was concluded, 28 American submarines had been called into action in support of the Fifth Fleet. Could 28 submarines responsible for more than 1,250,000 square miles of ocean area, support the Fifth Fleet with any significant contributions? They could, indeed, as the following account reveals.

Operation Forager called for a giant-step invasion across the Pacific from Majuro Atoll, where the Fifth Fleet was then based, to the islands of Saipan, Guam, and Tinian—a leap covering 1,800 miles of ocean.

During previous invasions—including the most recent, the Marshall and Gilbert operations—the assault forces had been supported by land-based aircraft. With no air bases close enough to the Marianas to provide such support, the Fifth Fleet would be required to provide pre-invasion air bombardment and to act as the covering force during the actual assault. Carrier task forces could not be spared for scouting missions, since their planes would be needed for strikes to consolidate positions at the Saipan beachhead.

Admiral Spruance, therefore, asked for submarines to act as the eyes of the Fleet. Vice Admiral Charles A. Lockwood, U.S. Navy, Commander, Submarines, Pacific, and Rear Admiral Ralph W. Christie, U.S. Navy, Commander, Submarines, Southwest Pacific, shifted their submarines from regular patrol areas to accomplish this special mission.

By 1944, experience with submarine support of Fleet operations had proved that submarines were capable of cutting the enemy's supply lines to the target areas; carrying out photographic reconnaissance of beachheads marked for amphibious landings and enemy military or naval installations marked for future reference; lifeguarding during air strikes; scouting in the target area and off enemy bases to report enemy forces which sortied to oppose the attacking U.S. forces; and intercepting and attacking fugitive shipping attempting to flee the target area. Forager submarines were assigned stations with these objectives in mind.

In March, while Forager was still in the planning stage, USS GREENLING (SS-213) successfully completed the photographic reconnaissance of Saipan, Tinian, and Guam.

During the month preceding the invasion, the Japanese supply line to Saipan was effectively interdicted by ComSubSoWesPac's wolf packs. A pack patrolled its area along the expected convoy course and maintained a distance between pack members of a little less than twice the range of visibility or radar range. This provided them with the broadest area of search, while maintaining an uninterrupted path of convoy detection. The first submarine to make contact informed the pack members by radio, then attacked the nearest flank of the convoy. The other pack members quickly took positions on each flank of the convoy. The original attacker

then assumed the *trailer* position to the rear and matched the convoy's course. From this position she could transmit information to the *flankers* concerning the enemy's tactical maneuvers; attack escorts as they charged after her mates; or finish off stragglers or cripples. Meanwhile, the *flankers* were busy making repeated torpedo attacks.

Patrol areas were divided into appropriately named sectors, *Pentathlon* covering the Marianas Islands area. The most successful operation of this type along the Honshu-to-Saipan sector of the Pentathlon area was conducted by a pack consisting of USS PILOTFISH (SS-386), Lieutenant Commander R. H. Close, USS PINTADO (SS-387), Lieutenant Commander B. A. *Chick* Clarey and USS SHARK (SS-314), Commander E. N. Blakely. Captain L. N. Blair was the pack commander.

At 0500, on 31 May, USS SILVERSIDES (SS-236), Commander J.S. Coye, operating in the vicinity, radioed the pack that a convoy was coming their way—contact was made at 0900. SHARK took up the port flanker position, PINTADO took the starboard flank, and PILOTFISH dropped back as trailer. This planned attack was foiled by radical zig on the part of the convoy, as was a second approach made shortly after midnight on 1 June.

At this time, however, SILVERSIDES made contact with a second convoy, and PILOTFISH was sent to intercept it. Finally, the Japanese merchant ships, or Marus, began to feel the bite of the wolf pack that surrounded them. An unfortunate size for the convoy created a perfect attack position for PINTADO. She sank the 4,716-ton TOHO MARU with five torpedo hits and damaged a second merchant ship with a single shot from her tubes.

When SHARK contacted a third convoy, the real action began. Japanese aircraft arrived and a chase to the northwest ensued from dawn, 1 June, until dusk, 2 June. Each time a submarine raised her periscope, a Japanese plane was there to force her below. At 2300, 2 June, however, their tenacity was rewarded; SHARK sank CHIYO MARU, a 4,700-ton freighter.

SILVERSIDES withdrew to refuel, but the pack continued to trail the Japan-bound convoy during the next day. That afternoon PINTADO spotted a fully loaded convoy heading south, probably bound for Saipan. Since the first three convoys were returning to

Japan in ballast, the pack about-faced for a crack at the loaded merchant ships.

When the submarines had attained attack position at 1400 on 4 June, they began a series of coordinated attacks that lasted two days and riddled the convoy with losses. SHARK was first to draw blood. KATSUKAWA MARU, a freighter of 6,886 tons went down at 1430 on 5 June, followed by the 3,080-ton TAMAHIME MARU and, that same evening, the TAKAOKA MARU. PINTADO sank the 2,825-ton KASHIMASAN MARU, and the 5,652-ton HAVRE MARU, both heavily loaded with cargo.

One pack had prevented nearly half a division of reinforcements from reaching Saipan. A Japanese officer's diary, recovered later at Saipan, stated that they were expecting 10,000 troops with arms, ammunition, and artillery. When the remaining ships of the convoy arrived at Saipan, 6,000 soldiers were missing and the reinforcements that did arrive were largely without arms.

Patrols in the other areas of the Pacific were meeting with similar successes. Vice Admiral Lockwood, based at Pearl Harbor, and Rear Admiral Christie at Fremantle, Australia, were busy reassigning patrol submarines to new scouting and lifeguard positions. Christie's area of command was located west of Guadalcanal, south of New Guinea, west of the mid-Philippine Sea and south of mid-Luzon Strait. ComSubPac controlled the rest of the Pacific.

SubPac's bases had advanced westward during the War, causing its area to be increased accordingly. Since Forager required scouting in both command areas, a more practical scouting boundary was worked out between ComSubPac and ComSubSoWesPac which moved SubPac's area south to include Luzon Strait and west to include the coast of the Philippines.

ComSubPac spelled out his strategy for Operation Forager:

> Those in the immediate vicinity of the Marianas will be retired in order to clear the area for the advance of our surface forces. During Forager operation submarines as available will be placed in interception positions to the southwest of the Marianas and on the approaches to the

Marianas from the Japanese empire to attack and destroy enemy forces approaching the Marianas and escaping therefrom and to furnish advance warning of the approach of the enemy Task Force.

Specific interception positions were not enumerated, since a long campaign was anticipated and the number of submarines on patrol would vary from week to week. The plan also provided for lifeguards to be assigned positions off the coast of Guam, Tinian, and Saipan for the air raids of 11 June which softened up the islands for the 15 June invasion.

Intelligence reports from Seventh Fleet Headquarters at New Guinea indicated that the main Japanese Fleet was now based at Tawitawi, the southernmost island in the Sulu Archipelago. The movement from Japan to Tawitawi was necessitated by the ever-decreasing supply of fuel oil arriving in Japan from the *Southern Resources Area*. U.S. submarines had been at work. The South China Sea, Luzon Strait, and East China Sea formed a graveyard for Japanese tankers. Japanese warships were forced to come down to the source of supply—the oil rich islands of Borneo and Java. Since Headquarters in Tokyo expected an attack in the Caroline or Mariana Islands, Tawitawi was chosen as an anchorage between the oil fields and the expected battle area.

ComSubSoWesPac assigned USS HARDER (SS-257), Commander Sam O. Dealey, USS REDFIN (SS-272), Commander M. H. Austin, and USS BLUEFISH (SS-222), Commander C. M. Henderson, to the Tawitawi area, with USS HADDO (SS-255), Commander C. W. Nimitz, Jr., as relief. USS HAKE (SS-256), Commander J. C. Broach, USS BASHAW (SS-241), Lieutenant Commander R. E. Nichols, and USS PADDLE (SS-263), Lieutenant Commander B. H. Nowell, were stationed between Mindanao and the Talaud Islands. USS JACK (SS-259), Commander A. E. Krapf, and USS FLIER (SS-250), Commander J. D. Crowley, patrolled off the west coast of Luzon.

ComSubPac organized Submarine Task Force 17 to support Operation Forager. Admiral Lockwood stationed the ubiquitous PINTADO and PILOTFISH and USS TUNNY (SS-282), Commander J. A. Scott, southeast of Formosa in the Luzon Strait,

but later reassigned them to the route between the Marianas and Ryukyus. USS FLYING FISH (SS-229), Lieutenant Commander R. D Risser, was stationed at San Bernardino Strait; USS GROWLER (SS-215), Commander T. B. Oakley, reported to Surigao Strait after lifeguarding at Saipan until 12 June. Watching for sorties from Japan and covering the Bonin Islands area were USS PLUNGER (SS-179), Lieutenant Commander E. J. Fahy, USS GAR (SS-206), Commander G. W. Lautrup, USS ARCHERFISH (SS-311), Commander W. H. Wright, USS PLAICE (SS-390), Commander C. B. Stevens, and USS SWORDFISH (SS-193), Commander K. E. Montrose. Ulithi Islands to the Philippines was covered by USS MUSKALLUNGE (SS-262), Commander M. R. Russillo, USS SEAHORSE (SS-304), Lieutenant Commander Slade D. Cutter, and USS PIPEFISH (SS-388), Lieutenant Commander W. N. Deragan. The area west of the Marianas, north of the Palau Islands, and south of the 20th parallel was patrolled by USS ALBACORE (SS-218), Commander J. W. Blanchard, USS SEAWOLF (SS-197), Lieutenant Commander R. R. Lynch, USS BANG (SS-385), Commander A. R. Gallaher, USS FINBACK (SS-230), Lieutenant Commander J. L. Jordan, and USS STINGRAY (SS-186), Lieutenant Commander S. C. Loomis. Three unnamed submarines also covered the islands of Woleai, Palau, and Truk, scouting the area and availing themselves for lifeguard duty.

Thus, it was arranged that an enemy sortie to the Mariana Islands from any direction would be detected in all likelihood by one or more of these submarines.

The most productive scouting accomplished by a submarine in the Tawitawi area was that of HARDER. On 26 May, HARDER left Fremantle on her fifth war patrol with a two-fold mission. She was ordered to pick up six British coast-watchers from the northeast coast of North Borneo and then to scout the Tawitawi area.

By evening of 6 June, HARDER had arrived at the entrance to Sibutu Passage between North Borneo and Tawitawi. To transit this passage, Commander Sam Dealey had to pass the entire Japanese Combined Fleet. That evening, he commenced an end-around on an enemy convoy, but was discovered by an escort

destroyer. As the destroyer charged toward him, Dealey turned his sub away, firing torpedoes from his stern tubes as he submerged. The payload struck home and down went the MINATSUKI in a ball of flames. On 7 June, at 1200, another Japanese destroyer spotted HARDER and headed directly for her. There was not time to turn away, so Dealey fired torpedoes "down the throat" of the HAYANAMI, sending her to the bottom.

HARDER finally arrived off the coast of North Borneo the night of 8 June, and succeeded in rescuing the six British agents, aided by Major W. L. Jinkins, A.I.F., an Australian commando. The trip back through Sibutu was more hair-raising than the original transit. Japanese planes had sighted HARDER on the morning of 9 June, and had radioed ahead to warn Japanese destroyers. At 2101 that evening, Dealey spotted two destroyers patrolling the narrowest part of Sibutu Passage. He waited until the destroyers were close enough that they would be behind one another when his torpedoes arrived. Firing a four-torpedo spread, he observed the first one run wide and the second and third hit the bow and the bridge of the first destroyer, TANIKAZE, which sank immediately. The fourth torpedo found the second destroyer's keel; the ship sank but was never identified. On 10 June, Dealey spotted a large Japanese Task Force of three battleships, four cruisers, and six to eight destroyers. As a destroyer peeled off toward HARDER, Dealey waited until the range was only 1,500 yards, then fired three torpedoes "down the throat" again. The first and second stopped the destroyer with tremendous explosions, as HARDER passed only 80 feet below.

Remaining in the area until 10 June, HARDER that afternoon observed the sortie of three battleships, four or more cruisers, and about six destroyers. She reported this important contact, and then retired from the scene, little realizing the forceful effect her devastation of the Japanese destroyers had had upon Admiral Toyoda.

Admiral Spruance, on board USS LEXINGTON (CV-16), received the 10 June HARDER report, but realized that this was probably not a reaction to the presence of his fleet. His first air strikes were scheduled for 11 June, and he had no reason to believe that he had been detected as yet. Actually, this sortie was

headed for a different target. Admiral Toyoda was anxious to come to the relief of Biak after MacArthur's 27 May invasion. He ordered Operation KON into effect, sending Vice Admiral Matome V. Ugaki south with his Task Force of battleships to counter MacArthur's movements.

Toyoda soon realized, however, that the decision to split his fleet was unwise. He was laboring under the misconception that his anchorage was the focal point of a great enemy Submarine Force. HARDER had single-handedly played the part of a "great enemy Submarine Force" by sinking three destroyers, with two probables to her credit. Badgered by the submarine threat, Toyoda decided his fleet would be safer on the high seas. They could ill afford to lose another escort destroyer. As reports reached Tawitawi of the 11 June air raids by Vice Admiral Marc Mitscher's Task Force 58, Toyoda, already over-anxious, "jumped the gun". At 1830 on 12 June, Admiral Toyoda ordered Operation A-Go into effect.

A-Go was designed to counter any further moves by the Allied forces. Intelligence indicated to the Japanese that the Palau islands would probably be invaded next. In this case, the Combined Fleet was to halt the invasion by streaming from Tawitawi to the Palaus to attack the Fifth Fleet. In the event that the Marianas were invaded first, aircraft from the Bonin Islands would attack the U.S. Fleet, land in the Marianas for refueling and rearming; then take off the next morning, bomb the fleet again, and land on aircraft carriers of the Combined Fleet, which, by that time, would have reached the area. The Japanese Fleet could then complete the destruction of the Fifth Fleet. Such was the thinking of the Japanese Headquarters in Tokyo. This plan, however, required precise timing, an element that was sorely lacking.

At 1000, 13 June, Vice Admiral Jisaburo Ozawa, in command of the main body of the Combined Fleet, sortied with his Task Force from Tawitawi to implement A-Go. But Headquarters in Tokyo, believing the major invasion still would appear at Palau, did not put A-Go into effect until the morning of 15 June, when they finally realized that Lieutenant General Yoshitsugu Saito and Vice Admiral Chuichi Nagumo at Saipan had mistaken the preliminary bombardments for a hit-and-run raid. This two-day

delay had a significant effect on the battle, which ensued in the Philippine Sea.

No sooner had Ozawa's fleet put to sea than it was discovered. At 1100, 13 June, REDFIN was on hand at the northwest sector off Tawitawi when the impressive armada passed before her. Commander Austin quickly dispatched his message, reporting that a fleet of six aircraft carriers, four-battleships, five heavy cruisers, one light cruiser, and only six destroyers were headed for the Sulu Sea.

Admiral Spruance received this report with some relief. He knew that the Main Body of the Japanese Fleet was now on the sea and had been detected. At least there would be no sneak attack this time.

At 0840 on 15 June, FLYING FISH was patrolling off San Bernardino Straits when Lieutenant Commander Risser observed several scouting planes in the area. As the aircraft patrols continued throughout the day, Risser related, "Something was apparently in the wind, and we figured we were right down-wind." Sure enough, at 1635, he sighted masts emerging from the Straits, but, unfortunately, FLYING FISH was 11 miles north of the contact. His estimate was inaccurate due to the long range, but at 1925 Risser reported three carriers, three battleships, and various cruisers and destroyers on course 080 degrees, speed 20 knots.

Inaccuracy did not obscure the significance of this report from Nimitz and Lockwood at Pearl Harbor, or Spruance on board LEXINGTON. This was Ozawa's Main Body emerging into the Philippine Sea. Lockwood now put into motion his plan to intercept Ozawa's fleet. He and his operations officer, Captain Richard G. Voge, U.S. Navy, had plotted a square on the chart athwart the probably track of the onrushing enemy. The square, 60 miles to a side, was to be patrolled by the submarines ALBACORE, BANG, STINGRAY, and FINBACK, one to each corner. The submarines would cover 270-degree arcs, around the outside of, and at a 30-mile radius from the four corners. This left the center of the square vacant for possible Fifth Fleet maneuvers.

Spruance now knew his principal adversary's location, but where was the southern battleship fleet that HARDER had

reported five days earlier? The Admiral would soon have his answer.

Lieutenant Commander Cutter in SEAHORSE, was heading his ship northwest en route to patrol station at Luzon. At 1945 on 15 June, while 200 miles east southeast of Surigao Strait, he reported, "TASK FORCE IN POSITION 10-11N 129-35E...COURSE NORTHEAST, SPEED 16.5 KNOTS...SEAHORSE TRAILING." Engine trouble doomed her chase, however, and Japanese jamming of SEAHORSE transmission prevented her report from reaching Admiral Spruance until 0400, 16 June.

These two enemy task forces, located and reported on converging courses, caused Admiral Spruance to alter his plans for the invasion of Guam, scheduled for 18 June. Faced with the prospect of covering a new invasion and simultaneously defending against a Japanese naval offensive, Spruance on the morning of 16 June postponed the invasion of Guam and prepared for battle.

The enemy tracks were plotted ahead, and a proposed rendezvous was located. Spruance figured they would have to refuel at this time, but the true location of the refueling area was anyone's guess.

The Philippine Sea at this time was almost crowded with submarines, either on station, proceeding to the relief of a patrol, or returning from being relieved. With all this activity going on, one submarine was bound to run into ships of the enemy fleet. At 2306 on 16 June, USS CAVALLA (SS-244), Lieutenant Commander H. J. Kossler, heading west to relieve FLYING FISH at San Bernardino came upon a convoy of two tankers and three escorts on course 120 degrees at 15 knots. Kossler had found the Second Support Force, following Ozawa's Task Force from its anchorage at Guimaras in the Philippine Islands. By 0315, 17 June, he had brought his ship ahead of the convoy and was about to make an approach when, at 0402, he discovered an escort close abeam attempting to ram CAVALLA. Kossler quickly submerged and hid for an hour. At 0506, CAVALLA surfaced in an empty sea, and Kossler dispatched his contact report at 0545, informing Lockwood that he had lost contact and was proceeding to relieve FLYING FISH.

Lockwood received the message with alarm. If CAVALLA could find these tankers and sink then, he reasoned, the Combined Fleet could be partially immobilized for, obviously, they were running low on fuel. In this condition they would be sitting ducks for Task Force 58. If attack was not possible, at least by trailing the tankers, CAVALLA would probably be led to the Combined Fleet, itself. Therefore, he quickly replied to the CAVALLA, "DESTRUCTION THOSE TANKERS OF GREAT IMPORTANCE ... TRAIL ... ATTACK ... REPORT ... KEEP YOUR CHIN UP." The last part of this transmission referred to CAVALLA's reported engine trouble. She attempted to chase at four-engine speed, but Lockwood ordered two-thirds speed, aware that engine failure at such a moment would ruin a golden opportunity.

At this time, Lockwood was functioning as Commander, Task Force 17, as well as ComSubPac, which placed the tactical direction of Forager submarines in his experienced hands. He stationed his submarines to trap the enemy and destroy him. SEAWOLF was ordered south 150 miles from her station on the 16th parallel, SEAHORSE, MUSKALLUNGE, and PIPEFISH were shifted north from the Ulithi area. These four subs were ordered to locate and attack the tankers. The *square* was shifted southwest 100 miles to intercept the proposed refueling area. Lockwood's next order was most significant, for it granted the submarine skippers the freedom they had longed for—the freedom to attack the Combined Fleet at will, without first having to report the contact. CAVALLA, in the meantime, had been driving southwest, desperately trying to close the gap. At 1957, 17 June, a radar contact developed into 15 pips. Kossler had run into part of the Combined Fleet zig-zagging between 60 degrees and 100 degrees at a speed of 19 knots. Presented with such an array of targets, he was sorely tempted to drive in for the attack. But at 2029, he gave in and submerged to count the ships as they passed overhead. Unlike the group patrolling the square, CAVALLA had been ordered to continue reporting first and attack later. A similar ComSubPac instruction had stated: "The primary mission of all submarines is attack except in the case with a contact with a large enemy task force...concerning which there has been no previous

contact. In such a case, the primary mission of the first submarine making contact is to send out a contact report and then to attack." CAVALLA surfaced when she thought the Task Force had passed, but was discovered by two fast escorts in the rear of the group. After an hour of evasive tactics, she finally was free to transmit her report at 2245 of "15 or more large combatant ships." Kossler then proceeded east, trying to catch the enemy.

Spruance received the report on board LEXINGTON at 0345, 18 June. He was puzzled by the fact that only 15 ships were reported. Previous intelligence reports indicated Toyoda was capable of sending 40 combatants to sea. Also, since FLYING FISH's report at San Bernardino, Ozawa had advanced only 500 miles for an average speed of 8.8 knots. A strangely familiar Japanese fragrance was in the wind, and Spruance didn't like the smell of it. Possibly the Japanese were holding back part of their Fleet, waiting for the remainder to outflank the Fifth Fleet and isolate the beachhead at Saipan.

Ozawa, however, had no such intentions. He was waiting for the order from Tokyo that would send the A-Go aircraft down from the Bonin Islands to attack the American Fleet. When Toyoda prematurely set A-Go into motion from his end, he had caused Ozawa to arrive in the Philippine Sea 24 hours early. He was now forced to waste time and fuel by steaming on east-west legs, which allowed his ships to be discovered. Ozawa stated after the war that he had intended to run straight through the middle, since his Task Force did not have enough fuel for a flanking action.

CAVALLA continued east, unaware that Ozawa's Combined Fleet had turned on a northeasterly course. At 0545, 18 June, she informed Pearl Harbor that she had not regained contact. She then gave a more detailed description of the Japanese Task Force, and continued the search. The enemy was on the loose.

Toward evening of the same day, Spruance received further indications of a dual advance by the Japanese Fleet. At 1955, STINGRAY attempted to transmit a routine report. A fire in her antenna wires, however, made her transmission unreadable. Spruance, believing the transmission to be a possible contact report, noted that STINGRAY's estimated position at the time of

her report placed her 175 miles east southeast of a High Frequency Radio Direction Finder fix, which was received from Pearl Harbor at 2030.

Spruance was no more suspicious than at the time of CAVALLA's report that Ozawa was approaching with separate forces. He decided to remain on an easterly course throughout the night in order to protect Saipan. Informing Vice Admiral Mitscher, Commander, Task Force 58, of his decision, Admiral Spruance cautioned, "End run by carrier groups remains possibility and must not be overlooked."

FINBACK, patrolling the northwest corner of the square, found yet another portion of the enemy's fleet. At 1910, 18 June, she sighted two searchlights over the horizon bearing 270 degrees at latitude 14° 19′ North, longitude 137° 05′ East. She headed west, but was unable to locate anything, and, at 2010, she reported the sighting. The report was not received on board LEXINGTON, however, until 0150, 19 June, after Admiral Spruance, at 0038, already had made the decision to retire to the east.

Finally, Ozawa's Carrier Division I ran headlong into a *square* submarine. On the morning of 19 June, ALBACORE, working the southwest corner, made contact with Carrier Division 1 which contained Ozawa's new flagship, the carrier TAIHO, Commander J. W. Blanchard approached the carrier, whose speed was estimated at 27 knots, just as she was launching the second air raid against the Fifth Fleet. His position was perfect, but after waiting for the proper time to launch his six bow torpedoes, the Torpedo Data Computer failed to register a correct torpedo track. The carrier was approaching so fast that Blanchard had no time to recompute the track. Therefore, at 0909:32 he fired number one torpedo, observing its wake of steam, then correcting the lead angle on the second shot by compensating for errors in the first. He saw the first shots pass astern of the carrier so he led the sixth with a large angle. Number six did the job, exploding under the forward starboard elevator. The fifth shot might have been heading for the carrier, but Sakio Komatsu, piloting a Japanese bomber, exploded the torpedo with a suicide dive.

Blanchard was understandably disappointed with only one hit after waiting for such a beautiful setup. His report was listed as *probable damage* to the carrier.

Ozawa was not unduly disturbed by this single torpedo hit. The fire seemed to be under control, and his screening destroyers were making life miserable for ALBACORE.

He continued to steam southeast and, at 1130, ordered the fourth raid of the morning to attack the Fifth Fleet. His planes had barely reached the horizon when disaster again struck Carrier Division I.

The ubiquitous CAVALLA had been searching to the west for the Combined Fleet. After passing up two previous chances for shots at the convoy and Task Force, in order to make her contact reports, Kossler finally gave up the chase, and at 0055, on 19 June, reversed course and headed for San Bernardino. At 1148, she again stumbled upon her old friend, the Combined Fleet. It was Carrier Division I, and Kossler relates, "the picture was too good to be true!...it was apparent that we were on the track of a large task force heading some place in a pretty big hurry." He observed an aircraft carrier of the Shokaku-class, covered by two cruisers of the Atago-class, and one destroyer, and brought CAVALLA to a paralleling course to take a good look at the carrier. At a range of 1,000 yards, Kossler later said, "It looked like the Empire State Building." A periscope view of the mast confirmed its identity, "...there was the Rising Sun, big as hell." At this point, CAVALLA was abeam the destroyer, but remained undetected until 1220, when she fired four torpedoes. The fifth and sixth had to be fired on the way down, for by this time, the destroyer URAKAZE was after her. CAVALLA fought for depth, heard the satisfying rumblings of her three torpedo hits, and then spent three hours dodging and absorbing 106 depth charges. About 1500, CAVALLA's crew heard tremendous explosions—the SHOKAKU, the 30,000-ton monster had been blown apart by her own bomb magazines.

Things were not going well for Japan's pride of the fleet. During the afternoon of 19 June, Ozawa ordered a retiring course to the northwest. At 1532, an awesome internal explosion lifted the flight deck of his flagship, blew the sides out of the hangar

deck, and crushed the crew members in the engine spaces below. The Admiral quickly rescued his flag, and picture of the Emperor, and transferred to the waiting destroyer WAKATSUKI, closely followed by his staff. He arrived aboard the cruiser HAGURO at 1706, in time to witness the capsizing of TAIHO, the death of 1,650 of his crewmen, and the loss of 13 aircraft—all victims of one torpedo.

How had ALBACORE's single torpedo managed to sink a 31,000-ton ship? As discovered after the war, a novice damage control officer had hoped to rid the ship of deadly vapors from a ruptured gasoline tank by opening the ventilation ducts throughout the carrier. Instead, the fumes permeated the ship, and, coupled with the unrefined fuel oil from Borneo that TAIHO was using, this created the explosive situation. ALBACORE did not learn of her feat for many months, until a Japanese prisoner of war finally told the story.

The Combined Fleet's attack had withered and died. Ozawa's plan for destroying the enemy's planes as they passed over Vice Admiral Takeo V. Kurita's heavily screened Van Force, had backfired. Ozawa's Carrier Divisions 1 and 2 were not protected by this formidable advance guard. Instead they were left more vulnerable to the two crippling torpedo attacks. His four air raids had been systematically intercepted and chopped to pieces—victims of the "Marianas Turkey Shoot." Ozawa wisely retired to Okinawa.

Submarine Forces of the Pacific and Southwest Pacific Fleets could be proud of their contribution to Operation Forager. They had covered over a million square miles of sea, and covered them well. Their basic tasks of interdicting enemy supply lines to the target area, photo reconnaissance, life-guarding, patrolling, scouting, reporting enemy movements, intercepting, and attacking enemy fleets were carried out with skill and tenacity.

Theodore Roscoe wrote:

> From the point of view of the Submarine Forces, the Marianas Campaign and the Battle of the Philippine Sea...were so far as submarine support fleet operations was concerned—the high point of the war. Some naval strategists consider the action history's outstanding exam-

ple of the successful employment of submarines in a major fleet engagement. Effective scouting, efficient communications, intelligent handling and several smashing torpedo attacks combined to give the Submarine Force a leading role in the victory which meant the beginning of the end for the Imperial Navy.

Sound strategic doctrines, a proven set of tactics, improved equipment, and experienced manpower stationed at Headquarters, Pearl Harbor; Headquarters, Fremantle; at each periscope; and throughout every submarine—all played their part in the culmination of a highly successful operation.

Contribution of United States Submarines to "Operation Forager"

1. HARDER reports Ugaki's sortie, 1600, June 10.
2. REDFIN reports Ozawa's sortie, 1100, June 13.
3. FLYING FISH reports Ozawa's Main Body, 1925, June 15.
4. SEAHORSE reports Ugaki's Battleship Task Force, 1945, JUNE 15.
5. CAVALLA reports tankers, 0545, June 17.
6. CAVALLA reports Combined Fleet, 2245, June 17.
7. CAVALLA reports "Contact Not Regained," 0545, June 18.
   Submarines patrolling square:
   A. FINBACK
   B. BANG
   C. ALBACORE
   D. STINGRAY
8. FINKBACK reports searchlights, 1910, June 18.
9. Actual positions of STINGRAY, 1955, June 18.
10. Estimated position of STINGRAY, 1955, June 18.
11. High Frequency Radio Direction Finder fix, 2030, June 18.
12. ALBACORE sights TAIHO, 0816, June 19.
13. TAIHO hit, 0910, June 19.
14. CAVALLA hits SHOKAKU, 1220, June 19.
15. SHOKAKU sinks, 1501, June 19.
16. TAIHO sinks, 1532, June 19.

CAN *YOU* HANDLE THE STRESS?

(Testing to predict submariner performance in high stress situations)

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Disclaimer

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, nor the U.S. Government.

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Background

Stress affects everyone in every walk of life. Submariners are no exception and there are numerous external stressors such as family or romantic relationships, health issues, and financial factors contributing to how well an individual is able to handle stressors. Furthermore, there are a number of emotional states that

a submariner might experience while underway that may also affect his performance. For example, fatigue, monotony, and stress are common, and each of these can have an effect on how the submariner performs in his everyday duties. In fact, some research studies have shown that during the stress of combat-like training, the impairments in cognitive performance exceed those impairments seen following 0.10% Blood Alcohol Content[1]. Put a different way, individuals who are highly stressed show more severe cognitive impairments than individuals who are legally drunk! The study that showed this result was done with Special Operations Forces, suggesting that these stress-induced impairments affect even highly-trained and skilled military personnel, and that performance under stress should be a concern for all branches of the military.

There is a large amount of variability in how people respond to stressors, with some people performing well as dictated by their training, whereas other people freeze or perform other inappropriate actions during stress. Certain branches of U.S. Special Operations Forces are able to spend considerable amounts of time, effort and expense to determine who is best suited to respond to extreme stressors. However, not every branch of military service can devote those kinds of resources to selecting the best performing individuals, and it would be highly desirable to have a brief and low cost test that would help predict who responds optimally to stressors. For submariners, it would be advantageous to predict who is likely to be severely impaired by stressors. The Naval Submarine Medical Research Laboratory (NSMRL), located on Submarine Base New London, is developing protocols that will allow prediction of which individuals are best able to detect threats while under stress.

To address this in a research setting, it is first necessary to quantify an individual's stress level, and there are a number of ways to do this. A simple method is to ask the individual questions such as, "On a scale of 1 to 10, with 10 being the most stress possible, how stressed are you right now?" This method is simple and easy to collect; however, it relies on the person telling the truth or being able to know what their true stress level is at that very moment. Often, these limitations make this self-reporting

method undesirable. A more common way to quantify stress is to monitor the person's physiological response to a stressor. This can be done by monitoring cardiac, respiratory or sweat responses. These are advantageous in that they each are very sensitive to an individual's stress level, they are relatively easy to collect, and they are not easily biased by the person's intentions or beliefs.

Another advantage of these physiology measures is that they can be collected continuously during a long training session, essentially allowing for thousands of data points to be collected. A slight disadvantage of these is that they require specialized equipment, and the individual must be attached to several small electrode contacts and wires in a manner similar to the setup for a clinical electrocardiogram.

A third way of monitoring stress is to examine the hormones the body produces following a stressful event. Cortisol is a common stress hormone that is produced by the adrenal glands, and it is critical to help prepare the body for a *fight or flight* response. Cortisol does this by increasing blood sugar and promoting metabolism to allow the organism to respond to an emergency. Cortisol, and many other hormone levels can be determined from blood, urine, or saliva. Examining hormones has the benefit of providing a global picture of how stressed the individual is—and collecting the necessary fluids can be relatively easy. When using saliva, the individual simply spits into a test tube, which is later analyzed for the relevant hormone. However, the disadvantage of this method is that hormonal changes can take many minutes to occur in the human body, so hormonal analysis does not allow for very good insight into the exact time or what specific events caused the stress.

NSMRL has combined some of these methods to heighten the ability to monitor submariners' stress reactions. Specifically, both cardiac and galvanic skin response measures are continuously recorded, while concurrently collecting periodic saliva samples to examine cortisol and other stress hormones. This provides excellent resolution of the timing of events via the electrophysiology measures, as well as a view into the global stress level of the individual through the hormonal analysis.

One common method of inducing anxiety in humans in a research setting is through the use of a *conditioned fear* paradigm. In this paradigm, a neutral stimulus, such as an auditory tone, is repeatedly followed by an aversive event, such as a harmless electric shock. After experiencing multiple pairings of this tone-shock combination, individuals display anxiety responses to the tone alone, even when the shock is no longer present. In effect, the person has been classically *conditioned* to fear something which was previously innocuous and which elicited no fear. Note that this is not *fear* in the traditional sense of the word. Rather, it is an increase in anxiety or stress as measured by physiological measures, and these increases typically are similar to *fearful* responses, but at a very mild level. One advantage of these conditioned fear paradigms is that individuals typically learn to be fearful quickly (typically less than five minutes), making this an excellent approach for use in a research setting.

To assess performance, it is critical that there are decipherable performance measures available to analyze. For example, responding well in a combat situation involves vigilance, detecting threats, recalling proper response procedures from training protocols, initiating proper responses, and executing those responses until completion. Furthermore, combat is often complicated by a torrent of sensory information such as vocal commands, alarms, sudden noises, and random events.

Whereas replicating this complexity may be desirable for a training scenario, it is experimentally cumbersome to disentangle. If a participant fails in a training exercise, it is unclear at which particular phase they failed (e.g. Did they fail to detect the threat? Did they fail to recall the proper procedures? Did they get distracted while performing the proper procedure?).

For example, in one study examining performance on a military Combat Diver Qualification Course, personnel are placed in the water 3 miles from a target location on the beach, and must navigate underwater to this target without resurfacing, typically 45-55 minutes later[2]. A navigation performance score was calculated by measuring how far from their intended target the students arrived on the beach. This test is advantageous in that it mimics real-life scenarios with exceptional realism and places

significant stress on the divers. However, a diver's performance score is affected by a wide variety of processes, making it unclear from the navigation score where a diver fails or succeeds. For example, did the diver fail to mark the goal correctly when starting? Or, did the diver have problems with his re-breathing device while underwater? Did the diver get disoriented and then have to find his way back, or did he proceed directly, but slowly? Each of these scenarios suggests different performance problems, and identification of these problem areas is a key component of proper training and performance.

To look at threat detection in a stressful environment, a simple task which also has been demonstrated by other researchers to be sensitive to changes in performance is required. The test selected was one where a participant sits in front of a computer screen and views a series of rapidly presented letters one at a time, in the middle of the screen. The goal of the participant is to press a response button as quickly as possible to a specific stimulus. However, when a different, but similar stimulus occurs, the participant must not respond. In this experiment, the participant must press a button every time he sees the letter "**X**" but not respond when shown the similar shaped letter "**K**". The task demands can be manipulated to ensure that all participants are performing well, but not perfectly. The not perfect initial performance of participants is desirable because it allows easily observed improvements or impairments in performance. Certainly, this task is not threat detection in the typical use of the phrase, where a sailor might be scanning a sonar display for transient noises signaling the initial detection enemy submarine. Nonetheless, it is a simple version of threat detection, and it is an excellent task to use when first developing a testing protocol. Once researchers are comfortable with predicting performance on this simple, easy-to-understand task, then testing can move on to attempt predicting performance on tasks that are more realistic and more complicated.

Testing Method / Results

At Submarine Base New London, 27 sailors were tested on how well they detected the *targets* during stressful times when

they knew and were anxious that they were about to hear a very loud (115dB) and strident general submarine alarm, compared to *safe* times when they knew they would not hear the alarm. The participants were asked to occasionally pause and provide a saliva sample that was analyzed for cortisol and other stress hormones. The results indicate that threat detection was impaired when the sailors were in the fearful state compared to the *safe* state, particularly in the time immediately before the loud alarm. Interestingly, it was observed that the greater the increase in saliva cortisol level, the better the threat detection. However, with the cardiac response, an opposite effect was observed; the lower the cardiac response, the better the threat detection. Hence, those who show a large increase in cortisol and a small increase in heart rate are the best performers during stress; those who show a small cortisol response and a large increase in heart rate perform poorly under stress.

The results with a submariner population are in agreement with research with Special Operations Forces indicating that stress can significantly impair performance. These results also suggest that it might be possible to predict those who are best able to perform under stress by examining their salivary cortisol and cardiac responses during stressful training scenarios. Interestingly, other researchers have also reported that salivary cortisol levels during stress are positively predictive of superior performance during military Combat Diver Qualification Course testing[3].

Whereas cortisol is the only reported measure derived from saliva that predicts performance, there are a variety of measures derived from the blood that have been shown to predict performance. Specifically, plasma neuropeptide-Y concentrations (released from the hypothalamus in the brain) are positively correlated with good performance under mock interrogations during a highly intensive U.S. Army survival school. And, concentrations of dehydroepiandrosterone and dehydroepiandrosterone sulfate (hormones released from the adrenal glands) are significantly and positively predictive of superior performance during military Combat Diver Qualification Course testing.

Lastly, there is a psychological measure called *tendency to dissociate,* which predicts performance. Dissociation is a state whereby the person distances his/her mind from the current moment and environment. People who dissociate may report being involved in a situation but *watching the situation as an observer* or *outside of my body* or with blunted intensity. Research has shown across a number of studies that the greater the tendency to dissociate during stress, the worse the performance[4].

Implications

This research lays the groundwork for predicting performance levels of submariners and other military personnel when under stress. Given that a powerful collection of predictors from saliva, blood, and psychological tests are now available, one of the next steps is to investigate training scenarios that are more realistic.

Early in the submarine pipeline, students participate in a number of stressful training scenarios, including a very realistic fire fighting trainer (students must extinguish actual fires producing significant vision impairing smoke and heat in a confined simulated engine room space), a Damage Control trainer (students must find and plug a series of increasingly difficult high pressure leaks from seawater piping systems in another confined simulated engine room space), and an Escape trainer (students must don the Submarine Escape and Immersion Equipment suit and conduct an escape from an actual submarine escape trunk located at the bottom of a 30 foot deep pool). For each scenario, stress response information derived from blood and saliva samples may be beneficial in creating an overall composite score of an individual's ability to perform under stress. For example, if a sailor shows physiological indicators that he has poor stress reactivity during all three training scenarios, and his psychological profile (previously derived from the SUBSCREEN test that he completed at Basic Enlisted Submarine School (BESS)) suggests that he is questionable for submarine duty, this might be invaluable information for decision makers when deciding whether a sailor should continue in the submarine pipeline. Certainly, it is preferable to remove a sailor early in the pipeline during BESS, rather than finding out a year or more later while on

a mission that the sailor is having major problems coping with stress on the boat, necessitating an emergency evacuation. Alternatively, a sailor identified in this manner might receive more focused training to help him improve his stress reactivity, or he can be considered for a rate that would not require peak stress responses. Conversely, a sailor who seems to perform very well under all stressors might be recommended for a leadership role in damage control situations.

Whereas this paper has discussed performance under stress, it is also important to realize that other physical and mental states such as monotony and fatigue can result in decreased arousal levels, which will also impair performance. Unfortunately, at present there is very little research examining these factors. NSMRL is beginning projects examining how these other psychological states affect performance and how performance can be optimized during fatigue or monotony. This research is in the early stages, but the work to date has laid important and solid groundwork in understanding how to predict performance during various physical and mental states. The goal of NSMRL research in this area is to help the Submarine Force distinguish and nurture its best and brightest submariners.

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Cited Research

1. Lieberman HR, Bathalon GP, Falco CM, Morgan CA, Niro PJ, Tharion WJ. (2005). The Fog of War: decrements in Cognitive Performance and Mood Associated with Combat-like Stress. Aviation Space & Environmental Medicine. 76 (7, Suppl.), C7-14.
2. Morgan CA 3rd, Rasmusson A, Pietrzak RH, Coric V. Southwick SM. (2009). Relationships among plasma dehydroepiandrosterone and dehydroepiandrosterone sulfate, cortisol, symptoms of dissociation and objective performance in humans exposed to underwater navigation stress. Biological Psychiatry. 66(4). 334-40.
3. Morgan CA 3rd, Rasmusson A, Pietrzak RH, Coric V. Southwick SM. (2009). Relationships among plasma dehydroepiandrosterone and dehydroepiandrosterone sulfate, cortisol, symptoms of dissociation and objective performance in humans exposed to underwater navigation stress. Biological Psychiatry. 66(4). 334-40.
4. Morgan CA, Southwick SM, Hazliett G, Dial-Ward M. (2008). Baseline dissociation and prospective success in special forces assessment and selection. Psychiatry (Edgmont). 5(7). 53-8.

NEW WWII SINKING DISCOVERED

by CDR John Alden, USN(Ret)

CDR Alden is a WWII submarine veteran and has conducted significant research on US WWII submarine actions. Results of those researches have been reported in his previous articles in these pages.

Sixty-six years late, a previously unclaimed US submarine victim has come to light! The sinking of the Japanese KAIBOKAN (Coast Defense Vessel) CD 219 has until now been attributed to U.S. carrier aircraft, but a recently translated report by a sister ship makes it clear that one of our submarines was the real killer. I am indebted to Erich Muelthaler, a German researcher, for translating the Japanese document and providing the essential information that follows.

On 12 July 1945 a hunter-killer group consisting of CD 219, CD 65, and minesweeper W 24 left Ominato to sweep the eastern approaches to Tsugaru Strait in a southern direction, starting from Erima-misaki on the Hokkaido side and continuing toward Shiraya-zaki on Honshu. The three ships formed a horizontal line covering a span of five nautical miles with CD 65 in the center, CD 219 on the eastern end, and W 24 on the western end. While working their way southward, CD 65 discovered and avoided two torpedo wakes at 2030 Tokyo time. Two hours later it heard two heavy explosions to the eastward and closed the range to investigate when CD 219 failed to respond to a call. A search revealed only some floating debris but no sign of CD 219 or any survivors. The KAIBOKAN had vanished together with its entire crew of 193 men.

A search of US records shows that the only submarine firing torpedoes at the time and location in question was CARP (SS 338) under Lieutenant Commander James L. Hunnicutt, USNR. CARP was a new Balao-class boat fresh out of the building yard at the Electric Boat Company in Groton, CT and on its first and only war patrol. It was also Hunnicutt's first command, which was noteworthy because he was the third of only seven reservists to

command fleet boats during the war. The deployment got off to an inauspicious start when the executive officer was hospitalized after a fall on deck while the boat was undergoing training at Balboa, and had to be replaced. The patrol report shows that of 83 men on board at the start of the patrol, 45 were not qualified; 38 of these were making their first war patrol. Of the nine officers, five had made no previous patrols. This was a remarkably inexperienced crew even at that late stage of the war. None-the-less, the report describes an aggressive and successful patrol.

The attack that downed CD 219 is of particular interest because of its circumstances as well as the difficulties involved in resolving its outcome. It started early on 12 July when radar contact was made on two ships whose tracks indicated that they were patrolling back and forth off Todo Saki light in Tsugaru Strait and whose pinging identified them as anti-submarine vessels. A third more distant target appeared on the radar screen about two hours later. The two closer ships were tracked throughout the day and identified as a minesweeper and a PC, but several attempts to reach a firing position were unsuccessful. Shortly before midnight Hunnicutt surfaced, made an end-around approach, and at 0115 on the 13th fired two Mk 18-2 torpedoes from tubes #3 and 4 at the larger target. At this point in the narrative the words *See special report* are inserted. Then at 0121 an unidentified explosion was heard, followed by another that was believed to be a depth charge. However, both targets remained in contact, so at 0337 a single Mk 18-1 was fired from tube #1. This one was seen to premature ahead of the target, which continued on course. (Although both CARP and CD 219 were reportedly using Tokyo time, they seem to have been several hours out of agreement. Such discrepancies between U.S. and Japanese accounts are unfortunately very common.) Before contact was lost, the minesweeper was seen to be signaling to the PC by searchlight, so the torpedoes had obviously missed the target.

The key to this case lies in the special report. Such reports were required for highly secret operations such as the employment of an experimental weapon. They were normally classified Top Secret or Secret and handled separately from the regular patrol reports. Even today they are not readily accessible to researchers.

However, enough information is available from other available records to provide a spare outline of the special operations—four in all—noted in CARP's patrol report. The first clue appears in ComSubPac's third endorsement to the patrol report, which credits CARP with nine ships sunk—three by torpedo, four by gunfire, and two by separate report—and six damaged by gunfire. Most were sea trucks or other small craft; those attributed to the separate report were a PC and a lugger.

The second source is the Submarine Operations Research Group's comprehensive list of submarine attacks. This indicates that during the patrol Hunnicutt fired 11 Mk 18-2s for four claimed hits, two Mk 18-1s for one hit, three CUTYs for 2 hits, and one DOGY for no hit. CUTY (or Cutie) was the code name for the Mk 27, an undersized swim-out torpedo with a passive sonar homing head. The less well-known DOGY was the Mk 28, also a homer but a full-sized weapon that had to be ejected by air. Both types became available only very late in the war and were subjected to extreme security measures in order to prevent the Japanese from learning of their existence. They were typically carried aft in order to be fired from the stern tubes against pursuing anti-submarine vessels. The DOGY was the special torpedo fired by CARP at the presumed minesweeper on 13 July in between the MK 18s. Since none of the four torpedoes hit their intended target, which was CD 65, it would have been pure luck for one of the straight-running MK 18-2s to continue on and hit a distant, unseen third ship. It appears much more likely that the homing DOGY could have been attracted to a new target, so it was probably the torpedo that accounted for CD 219.

Despite the positive evaluations by ComSubPac, no ships at all were credited to CARP in the Joint Army-Navy Assessment Committee's official postwar tally. The sea trucks, luggers, and probably some other victims as well were too small to meet JANAC's cutoff limit of 500 gross tons. Japanese records available to JANAC for the final months of the war were—and still are—notably fragmentary or contradictory if not entirely missing. However, previous postwar disclosures have provided evidence that the 1,535-ton cargo ship KOGA MARU and the 135-ton auxiliary subchaser CHA *59* were probably sunk by

CARP. The 745-ton CD 219 is a significant addition to that record. It was one of a large class of anti-submarine ships built under war emergency programs, and in size and appearance it closely resembled the Japanese pre-war minesweepers illustrated in naval recognition manuals. So to CARP's surviving wartime crewmen, a belated but hearty "Well done!"

ETERNAL PATROL

CAPT Alfred F. Betzel, USN(Ret)

CAPT Joseph E. Bonds USN(Ret)

CDR Robert L. Brown, USN(Ret)

RADM Julian T. Burke, USN(Ret)

CAPT Frank F. Clifford Jr., USN(Ret)

VADM William J. Cowhill, USN(Ret)

CAPT Robert H. Cox, USN(Ret)

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RADM Ross Norman Williams, USN(Ret)

DIGITIZING OUR U.S. SUBMARINE WWII WAR PATROL REPORTS

by John Clear EMC(SS) USN Ret.
Submarine Memorabilia, Inc.

Forward:

This effort by EMC (SS) John Clear USN (Ret) is truly remarkable. For over 40 years, although declassified, the remarkable exploits of the U. S. Submarine Force during WWII sat on microfilm in a few museums and files, essentially untouched. His initiative revealed factual accounts of each U. S. submarine war patrol during WWII. In my view, that delay in publication was a travesty which should not have occurred for our WWII submarine veterans.

The Cold War is over. It should not take four decades before the importance of U. S. Submarine efforts during that period are made public.

Very Respectfully,
VADM Roger F. Bacon, USN (Ret)

I first became acquainted with the WWII U.S. Submarine War Patrol Reports microfilm collection at the Naval Undersea Museum, Keyport, WA in the summer of 2006, while volunteering as a docent at the museum. This little known and very infrequently used collection is housed within the 3rd floor, non-lending library of this outstanding facility which is one of only a small hand full in our nation where these reports can be viewed.

Being a retired SubLant and SubPac Chief, whose naval career had included tours of duty on three of these WWII veteran submarines, I was interested in their war time history and achievements. With help from the museum's staff (in particular

Jennifer Heinzelman, Collections Manager), I soon became well versed with the library's microfilm reader as to how to set-up and peruse the film rolls of the 255 U.S. submarine's war patrol records. These numerous microfilm rolls are housed in large collection drawers there within the library.

What immediately struck me in reading these histories from the microfilm copies of the original paper reports was the succinct manner in which these histories had been recorded at the time of and where these events occurred. Some of these reports were almost *casual* in their presentation of these awesome events. As an example: one of my previous tours of duty was on the USS SEALION SS-315 which just happened to be the only submarine in history to sink an enemy battleship in wartime. To read the pertinent pages from within this particular report of this patrol one would think that this type of occurrence was rather commonplace and not of such monumental importance as it had been. Well known submarines and individual heroes of these times seem to be *alive* in their patrol report depictions. The officers making the input and the yeomen that typed up these multi-copy reports on their old Underwood typewriters did so with an almost clinical detachment, ultimately providing an insight as no other form of written historical log or book has given us.

Again with the aid of the staff I was able to print out some of these pages but it was a very slow and cumbersome chore. It wasn't until I was able to reconnect the microfilm reader's output directly to a computer and hence save pages in a digital format that this effort began to come together and make sense. From my research I had found that nearly half of these microfilmed reports were photographed in l6mm and the rest in 35mm, in that, again, I found another problem. The 16 mm pages were an easy and direct *save to* on the p.c., but the 35mm had to be worked on with an average of three shots and then laboriously *stitched* together with the computer's software. To say that this slowed down the procedure is an understatement. Fast calculations showed that I had about 5 years of 8-hour days ahead of me at the rate that I was proceeding.

By the fall of the year I had been hooked on this project. One day, while talking with an active duty LCDR and Jennifer, I

decided that this project had to be taken on in earnest in order to more easily share these historic times with the many rather than just the few that had access to these microfilm libraries. I wanted to get these stories out while we still had some of our WWII submarine veterans with us, whose stories were told within these pages.

Further research found that recent technology had been developed that could now take on this conversion in a manner that would not require the manual, laborious efforts thus far expended. This newer technology was basically a huge machine that could read and convert these microfilm rolls faster than I ever could hope to accomplish. Two major companies were queried as to cost. The pricing, while fair (quoted at over six thousand dollars), was not something that the museum, nor its supporting foundation, would be able to fund. With the help of a long time friend, Dan Martini EMCM (SS), USN Ret., a partnership was formed and registered in Jefferson County of Washington State with the express purpose of handling this project. The museum agreed to lend out the microfilm rolls (some 255) to the company that we had agreed upon and the partnership would pay the cost of the conversion process.

It was at about this time that Vice Admiral Roger Bacon, of the museum's foundation, had heard of our project and wanted to help make the project move into reality. Admiral Bacon's father had been a highly respected WWII submarine Commanding Officer and thus Admiral Bacon's interest in these reports had been in mind for many years.

The initial run received from the conversion company came down to 28 full DVDs containing all of the 1,600+ war patrol reports of the 255 submarines involved. We were provided with two master copies, one in .jpg (picture) format and the other in .pdf (Adobe Reader) format. These reports were assembled in hull number sequence, oldest to the newest of the participating WWII subs. As per SubPac's instructions, the vast majority of the war patrol reports were written within the required guidelines as follows:

(A) Prologue
(B) Narrative (date & time)
(C) Weather
(D) Tidal information
(E) Navigational aids
(F) Ship Contacts
(G) Aircraft
(H) Attacks
(I) Mines
(J) Anti-submarine measures, sonar, countermeasures, and evasive tactics
(K) Major defects
(L) Radio
(M) Radar
(N) Sound gear & conditions
(O) Density Layers
(P) Health, food & habitability
(Q) Personnel
(R) Miles steamed, fuel used
(S) Duration
(T) Factors of endurance remaining
(U) Communication, radar and sonar
(V) Remarks

It was also at this point that we registered our newly converted war patrol reports and were issued an ISBN number of 13: 978-0-615-17769-4. Together with an intellectual copyright being filed (to protect the digital conversion).

By early 2007 we had the final masters on hand and began further production from these sets. Admiral Bacon (as our mentor) financed the first (costly) five sets and donated these to the Newport, RI and Monterey, CA Naval War College libraries, the St. Mary's, Georgia Museum, USS Nautilus Museum, Groton, CT and the USS Bowfin Museum, Honolulu, HI. The partnership in turn provided a master set to the Naval Undersea Museum and to some eight submarines stationed at Bangor Submarine Base, WA during our quarterly NSL NW meetings.

Later that year, during the 2007 USSVI Alaskan Cruise Convention, these patrol reports were first introduced, in their new

user-friendly digital format, to the submarine community at large. We also posted this information on the internet at the same time. It was the partnership's agreement, to provide at no cost, any copy of any submarine reports to any WWII sub vet or his immediate family, several hundred individual boat's patrol reports were thus sent out. Many submarine authors, (Tom Clancy, et al), researchers, and historians were among the initial purchasers.

By 2009 it was decided to make these reports available for free viewing to the general public directly on the internet. Rich Pekelney of the Historic Naval Ships Association, (HNSA), was contacted and uploaded all of the reports onto their website with a bravo zulu sent back to the partnership and our mentor Admiral Bacon. While able to view the reports for free via the internet, these pages are not easily copied or printed out.

In quick order, further improvements in computer software allowed the reports to be further converted to a *compressed pdf* format greatly reducing the production time and lowering the overall cost to less then 1/10 of the initial offering. The total of the reports including all of the appendices (which include some fifteen cross references, by boat, C.O. etc.) are now on just 4 DVD's in this compressed .pdf format.

We have archived the initial run in the .jpeg format to allow for further *cleaning up* (in time) of some of the reports that were either too light, dark, smudged or had any other problems in their reading quality.

The outcome of this effort has provided an easy to use reference of the thousands of pages that if printed out on single sided paper, would be a book at over 22 feet across, a massive work!

The company, (now a corporation), has continued to provide these reports at an extremely low cost to a worldwide audience. Our initial desire to acknowledge our WWII Submarine Veterans still alive has been well met and we will continue in our stated efforts through Submarine Memorabilia, Inc.

GIRL OVERBOARD!

by CAPT Bud Alexander, USN(Ret)

With the genesis of women crewmembers aboard submarines, I am reminded of an incident that happened many years ago when "Girl Overboard" occurred while I had command of USS COBBLER (SS 344).

It was February 1970. We had completed a period of submarine services to units of the SIXTHFLT in the Ionian Sea and entered the port of Patras, Greece. Patras, then a city of 100,000, is located on the northwest corner of the Greek Peloponnesus peninsula. High, jagged, snow-capped mountains back the city with the Bay of Patras providing a deep blue contrast to the beautiful mountain scenery. COBBLER was the first American warship to visit Patras in over a year and the first submarine in several years.

Prior to our visit, our scheduled arrival was reported in each of the five local newspapers including an announcement that there would be open visiting the day after our arrival. As a result of the publicity, we attracted a crowd of over 1,500 waiting to tour the American submarine. Lieutenant Dave Krieger, with assistance from the harbor police, had managed to organize the crowd into the semblance of a waiting line on the pier. However, when he returned aboard to start the visiting, the crowd surged toward the brow attempting to get in a more favorable position. From that point on, the harbor police were unsuccessful at controlling the situation on the pier. For awhile, despite the pushing and shoving, we were able to get the visitors on and off the boat.

Then, it happened—a young local girl had just crossed the brow to the pier after completing her walk through the boat—when the crowd surged causing her to fall off the pier and into the water between the concrete pier wall and the steel hull of COBBLER. Almost instantly, Chief Petty Officer George Clarke reacted to the life-threatening situation and jumped in the water beside her. Within moments, she had been assisted from the water

and was back on deck. Fortunately, she was not injured. She was taken below, wrapped in a blanket and provided with coffee. After a short time for her to recover, I had CWO Warren Speh and Ensign Jerry Nifontoff escort her home in a taxi.

With all the warnings we had received prior to our deployment about the importance of maintaining good relationships during our port visits, I was concerned about the potential for whatever might evolve out of this accident. The young woman could have been seriously injured in the position she was in between the boat and pier. Chief Clarke's quick response and our attention to her welfare apparently forestalled any problem and no one in Patras seemed concerned. In accordance with SIXTHFLT Instructions, I submitted a *minor incident* report commenting that I did not anticipate unfavorable reaction or publicity. And, none occurred. (Later, I nominated Chief Clarke for the Navy-Marine Corps Lifesaving Medal.)

What did occur—was considerable interest in the young officers on COBBLER from the mother and sisters of the 17-year old who had fallen overboard. In fact—as Warren Speh recalled after escorting the young lady to her home: "I can assure you that we were very welcome in their home". The next day, we invited the family back to COBBLER for coffee and cake during which the mother conducted an around-the-table survey to see which of our young officers were single. Later that week, Warren and Jerry Nifontoff were invited to a neighborhood gathering of about one hundred people. "After about an hour and a half of meeting all the people, enjoying the music, food and drink, we made overtures to take leave. We were informed that was not possible as we were the primary guests and the party was called in respect of the way the COBBLER crew treated the family."

After a few more days in port, we departed for scheduled ops with the carrier and destroyers of TG 60.2—relieved that we had escaped any entangling arrangements with the female friends and siblings of our "girl overboard".

SUBMARINE NEWS FROM AROUND THE WORLD

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From the July 2011 Issue

PAKISTAN—Khalid Class Submarine: on 21 June 2011, AMI received information that the second of three MESMA Air Independent Propulsion (AIP) modules for the Pakistani Navy (PN) will be shipped from DCNS in the near term. The MESMA AIP system will be installed in one of the two remaining Agosta 90B class submarines in Pakistani naval service during its next refit in 2012.

The likely candidate is the PNS KHALID (S137), which was delivered to the PN in 1999 and is entering its mid-life overhaul window in 2012, which would be the prime opportunity to install the 8.7 meter (28.4ft) plug. The third AIP system is scheduled for delivery in 2014 and would be inserted in the PNS SAAD (S 138) when it begins its first major overhaul. The third unit of the class, PNS HAZMA (S 139) was built with its AIP plug already installed. PNS HAZMA entered service in 2008.

The mid-life refit and plug insertion will take place at the Karachi Shipyard and Engineering Works (KSEW) in Pakistan.

From the August 2011 Issue

INDONESIA—Another Entrant in the Submarine Race

In early August 2011, AMI International received information that Turkey has entered the fray for the Indonesian submarine program. Source indicates that Turkey is offering the Indonesian Navy (IN) two new construction hulls (probably Type 209/1400 Preveze class) in addition to one used Atilay class (Type 209/1200) as a grant or lease. The new construction hulls would be built in Turkey's Golcuk Naval Shipyard. Turkey's offer is the latest in what originally appeared to be a two horse race consisting of South Korea and Russia.

A major drawback in Turkey's offer is that both new construction units would be built in Turkey and Indonesia is looking for licensed production at its own shipyards. South Korea through Daewoo Shipbuilding and Marine Engineering (DSME) is offering three units of the Chang Bogo (Type 209/1200) class build under license in Indonesia. South Korea offered the three-hull deal for US$1.08B.

The last serious contender was Russia, which offered the Kilo 636 and Amur designs under a US$1.2B deal accompanied by a 15-year finance package with a 5.6% interest rate. Like Turkey, the submarines would be built in Russia as no Russian submarines have ever been built under license in a foreign yard.

In addition to the South Korean, Russian and now Turkish offers, Indonesia's Defense Minister in April 2011, did state that other designs were still being considered; probably a reference to the latest two designs available on the international market, the DCNS Scorpene and the ThyssenKrupp Marine Type 214.

With the program scheduled to begin in 2014, it appears that there is still time for other submarine builders to make their case for the Indonesian program that is calling for ten new submarines by 2024. Indonesia would most certainly entertain any offer at this time although the key will be technology transfer, shipyard modernization and finance programs; all of which Indonesia will need in order to carry out submarine construction in country. AMI believes that South Korea may be in the best position at this point due to its price offer of US$1.08B for three new construction units and a willingness to meet the technology transfer requests for Indonesian construction and shipyard modernization. South Korea also has experience with the Indonesian Navy through the mid-life modernization of its two Cakra class (Type 209/1300) submarines in South Korea in 2006 and 2009.

PHILIPPINES

Submarine RfP to be Released in 4th Quarter 2011

On 03 August 2011, AMI received information that the Philippine Navy (PN) intends to release a Request for Proposals (RfP) for two submarines in the 4th quarter of 2011. The estimated US$1B program (cost estimated by PN) is for two units, either

new or used. The sea service has left open the criteria of new or used hulls in order to explore all options and costs.

The submarine requirement derives from the PN's long-term acquisition plan, *Sail Plan 2020*. It specifically calls for two units by 2020 with the estimate US$1B in funding occurring in the *Capability Upgrade Plans (CUP) 2011-2016* and *2017-2022*. AMI still believes that this program must be considered very ambitious by the PN, which has never operated a Submarine Force nor has tried to finance a project of this magnitude.

When added to the PN's shopping list under *Sail Plan 2020*, this program appears to be very unrealistic. Currently, the PN is considering three new build platform landing docks (LPDs) in 2012, two new construction 1,000-ton offshore patrol vessels (OPVs) beginning around 2014, up to eight used US Coast Guard cutters (possibly Hamilton class High Endurance Cutters) as Excess Defense Articles through 2016 and the two diesel submarines by 2020.

When considering historical funding streams to the PN over the past several decades, one has to look no further than the Armed Forces of the Philippines Modernization Program (AFPMP) that ran from 1996 through 2008. In that time span, the PN did not procure any new construction or significant used platforms due to shifting priorities. There does appear to be a glimmer of hope as newly elected President Aquino in May upped the priority of the PN and authorized US$220M for procurements in the 2011-2012 timeframe. This was probably in reaction to the increasing rift with China over the Spratly Islands. The question is, will this type of commitment be maintained as the price for the shopping list gets much larger than the US$200M authorized for 2011-2012.

If the PN is able to acquire the funding for the submarine purchase, it will have to consider the entire package of acquisition, training and basing which could cost significantly more than the estimated US$1B. The Philippines has no basing or support structure for submarines and no historical background in regards to operating such vessels. Any deal will need to include the construction of a basing structure, through life support for the submarines and long-term training assistance for the crews.

AMI believes that the list of prospective candidates to fulfill the PN's requirements will be very small. The top candidate could very well be South Korea with its type 209 construction, operations and maintenance experience with the Republic of Korea Navy (ROKN) and Indonesia. The PN also has historical ties with South Korea though the procurement of used patrol vessels over the past several years as well as links in the shipbuilding industry. South Korea, looking to export submarines to Indonesia, could do the same for the PN, probably at reasonable cost in conjunction with an attractive financing package or a barter deal.

Other international candidates include the DCNS/Navantia Scorpene design, the ThyssenKrupp Marine Type 214, and the Turkish Type 209. AMI believes that the likelihood and timeline of a submarine purchase are probably now being driven by emotions related to the latest disagreements with China even though there is a requirement under *Sail Plan 2020*. The first step is to see if an RfP is released in the 4th quarter.

DID YOU KNOW?

FRANCE: On 24 July 2011, the French Navy named the fourth Barracuda class submarine TOURVILLE.

From the September 2011 Issue

Deal Reported for Six Yuan Class Submarines

Information received in late July 2011 indicates that Pakistan may be very close to inking a deal with China for the procurement of six Yuan (type 041) class diesel-electric attack submarines (SSK), equipped with air-independent propulsion (AIP).

Coming on the heels of a deal between the two nations for the procurement of the four Sword (F22P) class frigates in 2007 (three Chinese-built units delivered as of September 2010) and a reported deal for the lease of two type 054 (Jiangkai I) class frigates in early 2011, it now appears that China may indeed be continuing to increase its foothold in the region with yet another arms deal with the nation.

Pakistan has been in the market for a modern submarine to replace their aging Hashmat (Agosta 70) class submarines that

were commissioned in 1979 and 1980. In November 2008, it appeared that the Pakistani Navy (PN) was close to a deal with ThyssenKrupp Marine Systems (TKMS) of Germany (a deal that reportedly bested DCNS's offer of the Marlin) for the acquisition of five Type 214 submarines. Continuing to leverage the recent ship building deal with China and originally believed to put pressure on TKMS and DCNS, the PN announced in April 2010, that is was also considering the Chinese Yuan class SSK.

Although the Chinese solution will undoubtedly be less expensive and with a much more lucrative financing package than the European solutions, other aspects to consider will be the logistic support chain as well as integration into the existing French-supplied Submarine Force. The PN may indeed view the integration problem as minimal considering the variety of foreign-built vessels in their inventory.

Furthermore, according to an AMI in-country source, the PN has concerns about the quality and reliability of technical documentation from the Sword class procurement citing the Chinese documentation as incomplete and of insufficient detail. Such omissions could have potentially devastating consequences if the PN decides to acquire the Yuan class with similar technical documentation shortfalls.

While this deal is not complete, it seems to be moving ahead and will likely see a construction contract by the end of 2012. AMI anticipates that the PN will probably decide on the Yuan class AIP SSK as their replacement submarine. The advanced design and array of deployable weapons coupled with the lower initial cost for the Yuan class makes it a perfect solution for the PN's submarine requirements.

Should a contract be finalized by the end of 2012 as anticipated, the first unit will likely commission by 2015, followed by one unit each year through 2019, completing the class of five submarines.

INDONESIA

Submarine Deal with South Korea Close

With new SOF a planned September 2011 visit by Republic of Korea's (ROK) Defense Minister to Indonesia, a deal worth

US$1.08B may be secured for the procurement of up to three submarines. Reportedly, Daewoo Shipbuilding & Marine Engineering (DSME) is poised to become the primary bidder if Indonesia signs a memorandum of understanding with Minister Kim Kwan-jin. If this deal is made, it will edge out Turkeys recent offer to provide two new type 209/1400 Preveze class in addition to one Type 209/1200 Alitay class for grant or lease, and the Russian proposal to build either the Kilo (Project 636) or the Amur (Project 1650) designs.

Previously, the Indonesian Navy (Tentara Nasional Indonesia Angkatan Laut (TNI-Al)) had shelved plans for a new submarine program until 2012, but due to a quick recovery from the global economic crisis, it seems the country is green-lighting the procurement.

As a result of the TNI-AL's 2006 announcement that is was pursuing a replacement program for its aging Cakra (Type 209) submarines, a fierce bidding war began that encompassed the German (including a recent German/Turkish partnership), French and even Russian providers, as well as South Korea.

AMI estimates the deal will involve the construction of three new Chang-bogo (Type 209/1200) submarines. The first unit will likely be delivered in 2016 and the other two by the end of 2018. Furthermore, AMI also believes that the TNI-AL's other type 209 received service-life extensions by DSME, to keep them operational until the new submarines are fully operational.

The Chang-bogo (Type 209/1200) design is an improvement over the Carkra (Type 209/1300). Not only is it an improved hull design, with the capability of diving to 250-meters (820.2ft); it has a more efficient diesel-electric power plant and battery storage that gives it greater range and underwater endurance. ROK had plans of incorporating an air-independent propulsion (AIP) plant into the design and AMI believes this may appear in the Indonesian variant. The Chang-bogo also includes an anti-ship missile (ASM) capability (the Type 209/1200 is capable of supporting the submarine-launched UGM-84B Harpoon ASM and it is also likely the TNI-AL will request this capability in the final design.

Additionally, AMI believes that as the global economic condition stabilizes and navies seek to upgrade their Submarine Forces,

South Korea may use this sale as an opportunity to broaden its export market in the Asia-Pacific region. While, like many other nations, the ROK felt the effects of the 2008-2009 global financial crisis, South Korea's strong defense industry sector helped to cushion the blow to its economy and recover quicker than most analysts expected. As a result, AMI sees South Korea as a future hub for naval exports.

INDIA

Naval Program Update

Since the last complete rewrite of current Indian Navy (IN) project reports, a number of developments warrant discussion. A summary of these developments follows.

> SCORPENE (Project 75) Submarine: The IN, facing a significant force structure shortfall in its submarine fleet, has challenged Mazagon Dock Ltd (MDL) to expedite delivery of the six Scorpene submarines currently under construction. This shortfall is due largely to the country's lack of progress in creating a force structure of 24 new conventional submarines (as defined under its 1999, 30-Year Submarine Construction Plan). Previous delays in the construction of the six Scorpene submarines under Project 75 and the anticipated decommissioning of older Type 209/1500 and Kilo 877 class boats continue to make the 24 SSK force structure goal unachievable. AMI estimates, the IN will only have 15 conventional submarines in service by 2018, of which six will likely be the new Scorpenes.

Under Project 75, MDL and the French Shipbuilder, DCNS are currently expected to deliver all six units of the first batch of Scorpene submarines between 2015 and 2019. Unit 1 is expected to launch as early as 2013 with delivery expected to be around 2015. Under this timeline unit two should be delivered in 2016 and the remaining four units by the end of 2018. Based on the program's history, this seems aggressive, but that is certainly what is needed to progress toward the force structure objective.

In 2010, the Indian Government released a request for information (RfI) for the procurement of up to six additional conventional submarines under Project 75I. This new submarine design is expected to carry surface-to-surface missiles (SSM – likely Brahmos) as well as incorporate an air independent propulsion (AIP) system. AMI expects a request for proposals (RfP) to be released by the end of 2011 (see the April 2011 edition of Hot News at http://www.amiinter.com/wnpr/hotnewsarch/pdfversions/2011-04.pdf).

Potential candidates include:

- France DCNS and the Scorpene design
- Russia Rubin Design Bureau Amur design
- Germany HDW Type 214 design.
- Italy/Russia Fincantieri and Rubin S1000 design.
- Spain Navantia S80 design.

At least two of the Project 75I submarines are expected to be built at a foreign yard. AMI expects a second production line will be established in India, possibly at Hindustan Shipyard Ltd (HSL) with Larsen & Toubro Ltd (L&T). This second production line could allow both MDL and HSL to construct Project 75I boats concurrently.

DID YOU KNOW?

UNITED STATES: On 08 August, the US Navy took delivery of the Virginia class submarine USS CALIFORNIA (SSN781), eight-months earlier than originally scheduled.

AUSTRALIA: On 23 August, the Collins class submarine HMAS FARNCOMB reportedly suffered a main engine malfunction while at periscope depth. It was able to surface and return to port under its own power.

RUSSIA: On 31 August, tests for the fourth-generation nuclear powered ballistic missile submarine RFS YURI DOLGORUKY, have been successfully completed.

From the October 2011 Issue

DID YOU KNOW?

UNITED STATES: On 02 September 2011, construction began on the United States Navy's (USN) thirteenth Virginia class submarine, SSN 787 (no name), at Huntington Ingalls Industries (HII) at Newport News, Virginia.

UNITED KINGDOM: On 16 September 2011, the Royal Navy (RN) formally announced the name of the 5th Astute class submarine, HMS ANSON.

UNITED KINGDOM: On 21 September 2011, assembly began on the RN's newest aircraft carrier, HMS QUEEN ELIZABETH (R 08), at Babcok's shipyard in Rosyth.

RUSSIA: On 05 October 2011, Russia's first Yasen (Project 885) class nuclear powered attack submarine (SSN), RFS SEVERODVINSK, completed sea trials.

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. If possible to do so, accompanying a submission with a CD 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**.

A stipend of up to $200.00 will be paid for each major article published. **Articles accepted for publication in the REVIEW become the property of the Naval Submarine League**. The views expressed by the authors are their own and are not to be construed to be those of the Naval Submarine League.

Comments on articles and brief discussion items are welcomed to make **THE SUBMARINE REVIEW** a dynamic reflection of the League's interest in submarines.

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

LETTERS TO THE EDITOR

More Re: Loss of SCORPION

SCORPION's story and the necessity of security classification have fueled an unending speculation on the true causes of her loss. I was delighted to see Mr. Rule's letter shed light on the definitive engineering analysis of the evidence found by Trieste from the disaster site. If I may, I would like to add some more facts and conjecture to the story.

From 1977 to 1980, I had the privilege of serving at Naval Reactors as an assistant to Mr. William Wegner. Curious, I reviewed the wreck photos from SCORPION's and THRESHER's gravesites that were routinely made as part of a continuing monitoring program. In 1983 after my XO tour on NATHANAEL GREENE, I received orders to USS SHARK. Needless to say the cause of SCORPION's loss became more than idle curiosity and I read the Structural Analysis Group's report while at NR PCO School.

Later, while in command, I noticed some characteristics of SHARK that I am sure SCORPION shared. First, her battery ventilation air flow was significantly below what I was used to on 637 class submarines, to the point that a detailed ventilation survey of the battery well had been conducted in order to raise the maximum hydrogen specification to 2.0% rather than what I thought was sacrosanct at 1.5%. The equalizing charge procedure allowing for the charge to be suspended and recommenced in one hour had seemed irrelevant to me, but on SHARK, we were rarely if ever able to complete one without suspending the charge, preparing to ventilate, ventilating for about 20 minutes, redoing the ventilation lineup and restarting the charge within that hour.

Something I saw on GREENE where over time the pressure in the boat would rise to significant levels led to speculation on the following scenario: Returning from deployment SCORPION probably was accomplishing the routine maintenance that had been difficult while in the Med. One item, the test discharge is a significant controller of dedicated time. Starting with an equalizing charge, the test and followed by another charge, I am

certain that during the first charge her hydrogen concentration reached the 2% limit. On a transit with an SOA to maintain, particularly going home, the Captain and crew would be loath to spend more time at periscope depth than absolutely necessary, likely relying on oxygen candles and scrubbers for atmosphere control. If the pressure in the boat had risen, during the first equalizing charge, when SCORPION commenced ventilating or snorkeling, the pressure in the boat likely would immediately drop and the highly concentrated hydrogen inside the top of the battery cells would rush out of the flash arrestors. Many factors would need to combine to reach the 8% for an explosive concentration to be set off by the DC battery exhaust fan, but the plastisol evidence supports that it did. Though there are other explanations, the fact that SCORPION's detached sail was photographed with masts and antennas raised, is consistent.

The Structural Analysis Group report goes on to detail the effects of the explosion (insufficient to breach the hull) on the lower level operations compartment deck and the attached negative tank flood valve actuator that would leave a 10 inch unisolable hole for sea water to quickly reach the destroyed battery cells. Burned mattress ticking recovered at the site supports the horror her crew faced: explosion directly under where the majority of the crew slept, attendant injuries, fire, unisolable flooding and high concentrations of toxic chlorine gas in the same compartment as the ship control station and radio. The casualty simply overwhelmed the crew and the sounds of her hull imploding about 22 minutes after the first recorded explosion gives testament to the gallant fight her remaining crew waged trying to save her.

On a personal note, one of the individuals I had the pleasure to serve with twice was the last man to leave SCORPION when she stopped in Gibraltar on the way out of the Med. An electrician's mate, he never failed to impress me.

George W. Jackson
Captain, USN(Ret.)

More Re: RADM Rindskopf

The obituaries about Admiral Maurice H. "Mike" Rindskopf have tended to focus on his remarkable service on the USS DRUM (SS 228), as the youngest officer to command a *fleet boat* during WWII, and his later career in flag billets. He was also one of the very few—if not the only officer—to serve continuously on the same boat from beginning to end of the war. I first encountered him in 1949 when I reported on board his postwar command, the USS SEA CAT (SS 399). Oddly enough, during my time on board I never heard a word about his extraordinary wartime service.

The SEA CAT was a happy and well-run boat with an exceptionally congenial wardroom family under Commander Rindskopf and his lovely wife, Sylvia. Regrettably, they were soon transferred to other duties, but it was long enough for me to recognize him as the best commanding officer I would ever serve under. One unique aspect of his command style has always impressed me: the absence of profanity and obscenity in the crew. It was his stated position that such language was simply evidence of mental deficiency on the part of the user, and the crew followed his example as long as he was in command.

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

NAVAL SUBMARINE LEAGUE
29TH ANNUAL SYMPOSIUM 19-20 OCTOBER 2011

2011 Fleet Award Winners

RADM JACK N. DARBY AWARD
CDR Kevin S. Mooney, USN

FLTCM (SS) FRANK A. LISTER AWARD
CMDCM (SS) Shaun M. Peirsel, USN

CHARLES A. LOCKWOOD AWARD
LCDR Bennett M. Christman, USN

CHARLES A. LOCKWOOD AWARD
CSC (SS) Keith H. Seeley, USN

CHARLES A. LOCKWOOD AWARD
EM1 (SS) Edward E. Davidson, USN

VADM J. GUY REYNOLDS AWARD
CAPT Thomas J. Kearney, USN

LEVERING SMITH AWARD
LCDR Michael B. Jensen, USN

FREDERICK B. WARDER AWARD
ETC (SS/DV) Kevin Rench, USN

GOLD DOLPHIN AWARD
CAPT John K. McDowell, USN

SILVER DOLPHIN AWARD
EMCM (SS) Robert A. McCombs, USN

CERTIFICATE OF MERIT AWARD
Terrence J. Garbuzinski

DISTINGUISHED SUBMARINER AWARD
Admiral Kinnaird R. McKee, USN (Ret)

DISTINGUISHED CIVILIAN AWARD
Dr. Robert M. Snuggs

2011 NSL Literary Award Winners

First Place
"Those Pesky, Plucky Pickett Boats"
CDR John Alden, USN (RET)

Second Place
"The Making of a Myth"
RADM Jerry Holland, USN (RET)

Third Place
"Fearless Freddie; The Pied Piper"
CAPT Don Ulmer, USN (RET)

Best Article By An Active Duty Author
"Fixed Sonar Systems: The History and Future"
LT John Howard, USN

2011 Undersea Warfare Photo Contest Award Winners

First Place Award
"USS NEWPORT NEWS Leaving Dry Dock"
Mr. Chris Oxley

Second Place Award
"USS ALASKA (SSBN 732)(GOLD)
at St. Patrick's day Parade in Savannah, GA"
MC1 (SW) James Kimber, USN

Third Place Award
"U.S. Coast Guard C-130 Flying Over USS CONNECTICUT (SSN 22)
During ICEX 2011"
ETC (SS) Hector Castillo, USN (Ret)

Honorable Mention Award
"USS ALBANY (SSN 753) Returns From Deployment"
IS PRESENTED TO
MC2 Danna Morris, USN

Naval Submarine League Honor Roll

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Northrop Grumman Corporation - Undersea Systems
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SSS Clutch Company, Inc.

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Global Services & Solutions, Inc.
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L-3 Chesapeake Sciences Corporation
L-3 Communications Aerospace Electronics
Murray Guard, Inc.
Northrop Grumman Corporation-Maritime Systems (New in 2011
Oceaneering International, Inc.
Security Technologies International, LLC (New in 2011)
Subsystem Technologies, Inc.
Trelleborg Offshore Boston
TSM Corporation
VCR, Inc.
Westland Technologies, Inc. (New in 2010)

NAVAL SUBMARINE LEAGUE

COMPARATIVE STATEMENT OF ACTIVITIES
For The Year Ended: 3/31/2010

REVENUES	Restricted	Unrestricted	31-Mar-10 Total	31-Mar-11 Total
Contributions			$162,651	$162,810
Dues			67,678	62,397
Annual Symposium			265,356	262,220
Subtech Symposium			282,926	302,778
History Symposium			4500	4000
Bank Interest			0	305
Interest & Dividends			9,022	8,955
Advertisements			31,886	23,394
Rent			8,640	7,625
Realized & Unrealized Market Gain (Loss) On Investment			95,750	39,663
Royalties			1,211	51
CB Days Receipts			58,750	45,000
Other			7,477	1,126
Total Revenue			995,847	920,324
EXPENDITURES				
Awards and Grant			9,370	13,738
Publishing			93,099	86,468
Promotion			87,000	67,159
Annual Symposium			259,953	267,846
Subtech Symposium			218,972	253,333
History Symposium			8,581	11,301
Chapter Support			17,549	17,537
Total			694,524	717,382
SUPPORTING SERVICE			187,137	175,417
Total Expenditures			881,661	892,799
INCREASE (DECREASE) IN NET ASSETS			114,186	27,525
NET ASSETS, BEGINNING OF YEAR			243,499	357,685
NET ASSETS, END OF YEAR			$357,685	$385,210

NAVAL SUBMARINE LEAGUE

COMPARATIVE STATEMENT OF FINANCIAL POSITION

	31-Mar-10	31-Mar-11	
ASSETS			
CURRENT ASSETS			
Cash	$ 163,031	$ 132,895	-30,136
Cash Equivalents	24,211	23,980	-231
Accounts Receivable	16,504	6,098	-10,406
Investments at Market	379,448	428,052	48,606
Prepaid Expenses	8,825	12,153	3,328
			0
Total Current Assets	$ 592,017	$ 603,178	11,161
			0
FIXED ASSETS			0
Furniture & Computer Equipment	38,359	38,359	0
Office Condominium	251,021	251,021	0
	287,380	287,380	0
Less Accumulated Depreciation	(168,875)	(175,419)	-6,544
Total Fixed Assets	118,505	111,961	-6,544
			0
	$ 710,522	$ 715,139	4,617
LIABILITIES			0
			0
CURRENT LIABILITIES			0
			0
Accounts Payable	$ 0	$ 3,088	3,088
Accrued Expenses	0	0	0
Deferred Income	69,900	44,380	-25,520
Deferred Membership Dues	61,504	60,360	-1,144
Rental Deposit	675	675	0
			0
Total Current Liabilities	132,079	108,503	-23,576
			0
LONG-TERM LIABILITIES			0
Deferred Membership Dues	220,758	221,426	668
			0
Total Liabilities	352,837	329,929	-22,908
			0
NET ASSETS			0
			0
UNRESTRICTED			0
Undesignated	336,535	364,060	27,525
Board Designated for Equipment	21,150	21,150	0
RESTRICTED	0	0	0
			0
	357,685	385,210	27,525
			0
	$ 710,522	$ 715,139	4,617

NAVAL SUBMARINE LEAGUE

COMPARATIVE STATEMENT OF CASH FLOWS
For The Year Ended 3/31/2010

	31-Mar-10	31-Mar-11
OPERATING ACTIVITIES		
Increase (Decrease) in Net Assets	$ 114,186	$ 27,525
Adjustments to Reconcile Change in Net Assets to Net Cash Provided:		
Depreciation	8,565	6,544
Decrease (Increase) in Accounts Receivable	(10,125)	10,406
Decrease (Increase) in Prepaid Expense	(1,669)	(3,328)
Increase (Decrease) in Accounts Payable	0	3,088
Increase (Decrease) in Accrued Expenses	(4,392)	0
Increase (Decrease) in Deferred Revenue	(17,831)	(25,522)
Increase (Decrease) in Deferred Membership Dues	(1,593)	(476)
Net of unrealized and realized (gains) and losses on Investments	(95,750)	(39,663)
NET CASH (USED) BY OPERATING ACTIVITIES	(10,609)	(21,426)
INVESTING ACTIVITIES		
Investment in Securities	(8,989)	(8,941)
Proceeds from Redemptions and Sales	0	0
NET CASH PROVIDED (USED) BY INVESTING ACTIVITIES	(8,989)	(8,941)
NET INCREASE (DECREASE) IN CASH	(19,598)	(30,367)
CASH ON HAND, BEGINNING OF YEAR	206,840	187,242
CASH AND CASH EQUIVALENTS ON HAND, END OF YEAR	$187,242	$156,875
SUPPLEMENTAL DISCLOSURES OF CASH FLOW INFORMATION		
Cash Paid During the Year for:		
Interest Expense	$ -0-	$ -0-
Income Taxes	$ -0-	$ -0-

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	(If shipped to VA address add 5%)	VA SALES TAX	
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		TOTAL	

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