# THE SUBMARINE REVIEW

## JULY 1999


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## EDITOR'S COMMENTS

Each year the July issue of **THE SUBMARINE VIEW** finds itself in a *target-rich environment* for source material, with both the Submarine Technology Symposium and the League's Annual Symposium taking place in the weeks immediately prior to the final make-up of the magazine. Some selected presentations from those two symposiums are presented here and are both a bit different from that which we usually publish and of particular importance to all of us. While we normally carry at this time of year the very fine speeches by COMSUBLANT, COMSUBPAC, and the OPNAV Director of Submarine Warfare, and this year they were very fine indeed, we are instead publishing the important words of leaders outside of our own community in order to bring you viewpoints from several different perspectives.

This year we are particularly fortunate because both of those forums focused high level attention on two subjects of great concern to the submarine community: **force size** and **innovation by submariners**. In addition, the Secretary of the Navy, in his address to the Annual Symposium, issued several challenges to our community and that speech is presented here as the first order of business. The League was also fortunate to have as the Awards Luncheon speaker the Chief of Naval Personnel, and his Update on the status of the Navy's *people-situation* and management follows the Secretary's words. Ambassador Paul Wolfowitz, a leading thinker and doer of national security affairs, also gave an inspirational speech and that heads the section on the Technology Symposium.

The inadequacy of the present force size target of fifty SSNs was mentioned by each of the Flag Officers addressing both gatherings. Dr. Paris Genalis, of the Office of the Secretary of Defense, presented a well-balanced history of that force level target which is published here for the information of the entire membership. He also discussed some actions the submarine community can take to impact force size, and effectiveness, in the near future. Mr. Ernie Blazar, of the Lexington Institute, also treats the force sizing issue and recent commentaries about that problem in his piece at the head of the ARTICLES section.

The issue about the capability of the submarine community to innovate and adapt to changing times was not addressed as directly,

or as dramatically, as that of force sizing, but it was at the heart of both symposiums. The Submarine Technology Symposium, if only by its existence and endurance, is prime evidence of a willingness to take a hard look at current capabilities and requirements and project into the future with both threat projections and technology potential. To illustrate, the remarks of the Chairmen of the four technology sessions of this year's STS are presented, as well as an *out-of-the-box* look at the possible future face of weapon system technology. See also Commander Frank Borik's article on the innovative use of current submarine communications capabilities.

In other features of this issue, important news of a very high profile portion of the Submarine Centennial Commemoration is given by Captain John Shilling in his run-down for the submarine community on the status of the exhibit in the National Museum of American History of the Smithsonian Institution. Captain George Graveson has also prepared a report to the members on the League's program to honor outstanding graduates of NROTC units going into submarines. Also included are a status report on the controversy surrounding Australia's new class of submarines and an intriguing piece by a RAND researcher on the comparison of submariner skills and those of fighter pilots. For the lighter side don't miss the *boys-will-be-boys* story of DIODON sailors in the Panama Canal.

***Jim Hay***

## FROM THE PRESIDENT

The Naval Submarine League has just completed possibly the most interesting and stimulating NSL Annual Symposium of the seventeen. It is difficult to designate any single event or presentation as a highlight; each was superior. The two Force Master Chiefs gave talks at the beginning of the second day which caused even the many retired attendees to take note and comment on the quality of those two men.

The three commanding officers, Commander Mike Connor, USS SEAWOLF (SSN 21), Commander Bruce Grooms, USS ASHEVILLE (SSN 758), and Commander Jim Ransom, USS MIAMI (SSN 755), could not have been better. Each gave a different slant of operations and command; and each was a superb representative of the character of our commanding officers in today's Submarine Force.

The most stimulating talk and the one which was discussed well after it was delivered, was that of the Secretary of the Navy, the Honorable Richard Danzig. He had spent a great deal of his personal time in preparation of these remarks. Because of its thought-provoking nature and the challenges, he presented to all of us involved with the United States Submarine Force, Jim Hay has printed his speech in this edition of the **REVIEW**. No matter how any individual may perceive the challenges, they are real. Our approach should be to be able to intelligently address each challenge, understand its basis and assumptions, and know why any Force decisions are what they are (or why they might change). We should then serve as knowledgeable, viable and critical supporters of the Submarine Force in meeting these challenges. The NSL will attempt to stimulate that process.

I strongly encourage all of you to read the Secretary's comments.

And, have a good summer.

*Dan Cooper*

## SECNAV ADDRESS TO THE SUBMARINE COMMUNITY

*by The Honorable Richard Danzig*
*Secretary of the Navy*
*Naval Submarine League Symposium*
*June 3, 1999*

I want to do three things with you today. One is to talk to you about what I think are the most essential qualities of this community, its reasons for greatness. I don't exaggerate in that. I'd like then to relate to you a little myth, a Greek myth. Finally, I'd like to talk about the challenges of this community, and I'd like to relate that myth to those challenges and what I think are your special strengths, but also the issues that will be central for you in the time immediately ahead.

When I think about this community and its exceptional qualities, I think about the rich history that you've had; a history largely coincident with this century. I recognize that the 100th anniversary of HOLLAND will be celebrated next year many, many times. This will give us many occasions for reviewing this history. I think that much of the world may worry about the year 2000 from the standpoint of Y2K; I think your aviator and surface colleagues worry about it because it's the 100th anniversary of HOLLAND, and they're going to hear about it again and again.

I do recollect also, though, Garrison Keillor's wonderful comments about the worry about the coming of the year 2000. Said Garrison Keillor, "Why is there all this fuss? Imagine how the Romans must have felt as we approached the year zero." Eighteen, fifteen, twelve—it must have been very nerve wracking. His comment was, "What were they supposed to do, adopt the Hebrew calendar?"

Your history, coincident with this century, is a history of one achievement after another. It's an original, limited vision of submarines as scouting craft. It is stepping up to a mission in World War II that surpassed anything anybody ever expected. The anti-surface warfare accomplishments—where less than two percent of the force accounted for more than half of the kills of the Japanese surface fleet—are staggering.

That achievement was then compounded by, after World War II, recognizing that you were dealing with a new and a different world; the phenomenal technological, conceptual and tactical

achievements of coming to grips with anti-submarine warfare as a mission, and evolving again, to a wholly different thing on which the well being of our Nation depended.

Were that not enough, in the 1950s came the remarkable achievement of the transition to nuclear power and the successes that are represented by, the last time I looked, some 117 million miles of accident-free reactor performance. That is an amazing achievement—117 million miles. This is longer than all of the corridors of the Pentagon put together. An extraordinary accomplishment.

Then, were that not enough, the evolution of our missilery capabilities and the ability to be the mainstay of the Nation's strategic defense, a vision of an activity never really anticipated in the earlier years of submarine life; so that the majority of our Nation's strategic deterrent now rests on the Trident. The sense that, above all, this is the safest part. It is safe in your hands. The Nation is safe because you're there.

Were that not enough, the evolution then of the ability for tactical strike, the TLAM—the coming of the land attack missile. I was struck by this just within these last months, when the Nation responded to the terrorist attacks of Bin Laden on the embassies with submarine-launched Tomahawks. We don't like to make a big deal about it, but I mention it for a particular reason. This is an event, I think, unprecedented in the history of naval warfare; unprecedented in the sense that, for the first time, we used naval forces to influence events in a land-locked nation—Afghanistan.

What an extraordinary world, in which we say, Afghanistan, surrounded by land... we need to have an effect there... Let's turn to the Navy. Where do we turn within the Navy but the Submarine Force? It is ready, and it performs with extraordinary capability.

Were this not enough throughout all these years, there's a whole other dimension, which is the performance of the intelligence-related missions; which are now, unfortunately, altogether too famous in various publications, but which, nonetheless, suggest an ability to observe and to collect information that is a very fundamental part of our national power. Submarine taskings in these areas rise every year. The demand vastly exceeds the supply. It's a great achievement for the *Silent Service*.

So, at square one, I say to myself, it's hardly surprising that this community is acclaimed and appreciated and that you have an

influence well beyond your numbers—3,500 of you. You represent as officers, some ten percent of the Navy, and yet you really do punch above your weight. The admiration of you, and my respect for you, is very great.

When I thought about this, it seems to me that actually it ran even deeper, that while the achievements are very great in the ways I've just described, there's something more fundamental, more resonant in what you do. It seems to me to relate to the fact that you operate in an environment which is so hostile to human life, and you operate in a way that is absolutely unique, because you sustain human life in that environment over long periods of time, and you operate—in terms of success in your mission—for months upon end achieving things.

When I reflect on it, it's impressive to me that there is nowhere else in the military force where we have anything like this. Aviators are celebrated, and I think rightly, for their courage. But basically, they go up and they come down.

This is your classic sprint, your short performance, for which much intensity and preparation is invested. Your achievements are so great in terms of the environment that you're involved in. I look at surface warriors and I look, again, with a great sense of admiration at what they do, but they are not functioning underwater. Your environment tests you in the most dramatic kinds of ways.

I think this is why you see the great success of movies like Hunt for Red October or Das Boot, the sense of the very drama of the mission itself. A movie about a surface warfare tour probably wouldn't be a real grabber. If you really wanted to sustain the audience's interest, I think you'd have to throw in a shipwreck or two. That would be one way to do it. But would you really want to be a part of a community whose keystone movie is Hunt for Red October, or do you want to be a member of a community whose emblematic movie is Titanic? I think you're in the right place in that sense.

The hostility of the environment is emphasized by the fact, well known to all of you, that here, 10 cubic feet of water has a weight of a cubic foot of lead. Space is the only thing that's comparable in terms of our achievement. John Kennedy was right, as President, when he called your experience "the experience of inner space." Getting to space is a real trick. But once you're there, this

is a medium that is relatively easy to operate in. You move through it easily. You see through it easily. The weakest of radio signals will propagate. Look at where you are and what you do... that is a medium that has none of that friendliness. Yet, again, you sustain yourself there.

Then, that medium is phenomenally pervasive. If you take places on the globe, well known to you, seventy-one percent of the Earth is covered by ocean. But, even more fundamentally, if you take where things live, taking account of the depth of the ocean, 97 percent of this planet is your domain. We need to operate there. The fact that you do is essential.

There is something God-like about this achievement, this ability to live like Poseidon in the seas and under the seas. There is also something God-like about your circumstance as you do it—because you have an ability that we associate with the Gods. It is essentially, so long as you are quiet, to be virtually invisible. That invisibility gives you another God-like attribute, which is kind of an invulnerability. You move through these seas in a way that, because you are not seen, if you are not heard, will render you special and unique in your ability to hide.

From that derives the fact that you don't carry large amounts of defensive equipment. You are the ultimate warfighting machine. That resonates very deeply.

Now, this need to be quiet made me think about our myth. The Greek myth that came to mind is the story of a maiden who falls in love with a man, as all Greek stories tend to be. She was the maiden Echo. She made various advances to the most handsome of young men, the most charismatic, the most successful.

He sensed danger in her and withheld from her. She was called Echo, because, in effect, she bounced off of those she interacted with, and came back with her comment. When this love was not requited and she got nothing but the echo of herself back, she wasted away and eventually died for lack of love. The Greek myth is that all that survived was her voice. In the woods today, that's where you will hear an echo...

I thought of this, in part, because obviously an echo is dangerous to you—when you are *pinged* upon you are vulnerable. But it was the second part of this story that, to me, is the most striking about the challenges you confront. That is, the man she fell in love with was Narcissus. Narcissus, the most handsome of all, the most

successful of all, was perceived negatively by the Gods, in his interaction with Echo, and they decided to take vengeance on him for her death.

The way they did it was peculiarly apt. They seduced him into looking into a placid, flat pool of water. He looked at that pool and he became mesmerized by his own reflection. He saw this phenomenally handsome, successful man, and he was paralyzed. He fell in love with himself. Being in love with himself, he was unable to move, to break the image in the pond. Eventually he, too, wilted and died. Thus, the Greeks say, what remained of him became a flower, the narcissus flower.

It seems to me that it would behoove us to stop and say, "What are the risks to you from your extraordinary great strengths?" In some respects, I think those risks in here are the same things the risks to Narcissus were derived from. They are that we can become too mesmerized with our image of ourselves, that looking into this placid pool, we can believe that we have achieved some ideal. We can fall in love with ourselves, and fail to exercise the energy that rips us free and lets us do a lot of the things in the world we need to do. Having overcome the seductions of the echo, we can fall prey to the seductions of ourselves.

To highlight that point, let me tell you what I see as the most significant of the challenges for you in the time ahead—things not unknown to you and your leadership and that you're working with, but that it seems to me we need to overcome our images of ourselves in order to grapple with. I'll give you five—simply the fingers of one hand.

First, it seems to me that the very strength of the community has resided in the image of the isolated submarine commander, who goes out on his own and achieves, through tactical innovation and great imagination, the accomplishment of his mission, and returns in lonely splendor with the fruits of his work. But we cannot fall in love with that idea. Fundamental to our operation in this post-Cold War world, a world in which we believe in the doctrine of *From the Sea*, is our ability to integrate the Submarine Force with the rest of the Navy and the whole suite of national security activities.

It is our ability to work with the battle group. It is our ability to come in close to the littoral. It is an ability to define submarining not as a lonesome venture but as a venture that connects with

others. That poses very great untraditional challenges to this community. It poses challenges in the personnel systems. If we are to operate in those kinds of ways, we need to encourage careers that are not simply submarine focused.

One of the issues has been, over the years, how we find room and time in your very full, very richly platform-centered careers, to do these kinds of things. I very much applaud the leadership your community has shown when, in the course of this decade, it has encouraged people, in the normal course of maturation as a submarine officer, to get out into other positions in the Navy. The fact that at the moment you have chiefs of staff in 7th Fleet and 5th Fleet is a manifestation of what I think is the right outreach in meeting this challenge. You're not just looking in the reflective pool.

The fact that we have had heads of fleets—I see Admiral Fargo and Admiral Clemins as examples—who have a submarine background is a great enrichment to the Navy and ultimately to the Submarine Force. We need to do more of that. We need to create broader kinds of opportunities.

The larger Navy needs to reach out. It needs to consider things like making submariners battle group commanders. Also, there is a technological change demanded here. We need to overcome the notion that *run silent* is the necessary imperative of the Submarine Force in all circumstances.

Our communications capabilities have to be such that you can take advantage of the very remarkable things that, in fact, Admiral Clemins has been a leader in developing—the ability to network and coordinate and communicate with other communities and with other activities. The development of the on-hull, extremely low frequency antenna, of the next-generation antenna—is essential, technologically, to these kinds of evolutions.

I very much want to applaud and encourage the inclination to move on to these kinds of things, but say to you also, be aware of the risk. Don't simply stay with the image of where you were, or you will in the end become paralyzed in a Narcissus-like way. That, to me, is the first challenge.

These challenges relate—and the second one, it seems to me, in essential measure—relate to the achievement and your great strength in the nuclear area. I think the community needs constantly to struggle to achieve an emphasis on the front of the boat equivalent

to the emphasis on the back of the boat; to achieve an understanding and an investment in weapon systems that equals the understanding in propulsion systems; to achieve an understanding of fleet battle tactics that is something of the equivalent of our understanding of potential propulsion accidents and issues associated with them.

I think the community is disadvantaged by having a natural structure that makes its senior figure be the head of nuclear reactors. That disadvantage is mitigated, in my view, at present, by the truly extraordinary leadership that I think Skip Bowman provides in terms of breadth of vision. But, in the end, we need to push steadily to make sure that we put as much emphasis on the cart as on the horse, and that what drives our community cannot preponderantly be designing reactors, and then submarines around them, or careers around propulsion learning.

We need, in my view, to place an equal kind of research and development and operational emphasis on those other parts of our activities as on this one. Your leaders have the right idea in this regard. I think Skip Bowman particularly is pushing to transcend any propulsion-centered kind of orientation. But I think you need to recognize that the world values what you do; it doesn't value the platform that you're on. The platform is a means to an end. We need a more vigorous embracing of the end and adaptation to that.

Third, and related to this, I would like to see substantially more automation and grasping of the opportunities on submarines that come from moving technologically to a more modern position. A lot of people, when they get on submarines, fear claustrophobia. I must say, I have some of that. But when I get on a submarine, what I'm most afraid of is schizophrenia. The schizophrenia I experience is my own... and yours.

I see the most technologically modern, the most ambitious, the most precise, the most remarkable achievements. Alongside of them, I see the most anachronistic machinery, the disinclination to embrace changes in the way we do everyday kinds of business. I look at sonar operators, and I think, where is our decision support mechanism? Where are our visual displays that exhibit the potential of the 21st century? Where is the degree of automation that converts sound-powered telephones, with their clunkiness and their difficulties, into modern communications kinds of mechanisms? Well, your leadership is working on this with things like

the Virginia class submarines. I want to see more of that.

We have a steam plant set of systems that the surface Navy has, by and large, outgrown. Admiral Bowman and Admiral Fages are working hard on electric drive. We need to make that transition. We need to see a lessening of the demands on manpower and a movement more vigorously to an embracing of what the technology offers us in terms of change.

Our administrative data-keeping systems, our written reports and the like... The absence of the kinds of enterprise resource planning systems that Admiral Clemins has been pushing in other contexts, these are things that we can and should correct.

It leads to a fourth thing, which is the way in which we treat our junior officers and our enlisted force. In my view, there is great potential here for an even richer set of relationships than we are experiencing now. We have it right when we achieve the kinds of things that we just celebrated in Commander Van Buskirk *(Ed. Note: SecNav made the award to CDR Van Buskirk of the NSL Jack N. Darby Award for Inspirational Leadership and Excellence in Command)*—a unity between CO and crew.

To see it is one of the most moving and powerful things that I've ever seen in the course of the Navy. To see it, as I saw it for example, on HAWKBILL, when several of us had a chance to visit it in its expedition under the Arctic ice.

But we still burden our junior officers and our enlisted force with all kinds of distractions and excesses that drive down our retention rates and diminish the cohesion on board the ship. Admiral Jack Natter wrote a wonderful report about JO problems in the Navy as a whole. The Submarine Force was not exempt from them.

We have too many administrative kinds of burdens on JOs. We have too little time with real and direct responsibility of a kind that they can value to train in their specialties. We need to do more of that.

I am pushing, throughout the Navy as a whole, the introduction of a variety of kinds of labor saving devices. Painting, for example. Why is it that we burden our junior enlisted—I am asking in the context of the surface Navy—with such substantial demands on them in terms of painting and chipping all the time? If we can fire a TLAM 1,000 miles and have a CEP [circular error of probability, a "margin of error"] of a meter or two, why can't we

design paint that works without our having to paint and re-chip again and again? We need to care more about these things.

Now, you in the Submarine Force don't have the same exterior painting problems that the surface fleet has, but inside the submarine, those same issues occur. In some respects, they occur for you with a special vengeance. Why is that? Because you have such few really junior sailors that it winds up that the E-6 does the painting or cleans the bilge.

We need to move towards a revolution in the way we treat our sailors. In my view, there is a tendency to think of this still as though we were dealing with a conscripted labor force. We are infected still with the psychology of conscription. This is not a conscripted labor force. They leave when we don't get it right.

We need to increase our junior officer retention rates. They've gone up and down in recent years, but, at ballpark thirty-one percent, they don't get us where we need to be. Out of every eight JOs we need to have three department heads develop in the time ahead. That's a big challenge. We need to make sure that we balance people's lives.

Again, your leadership is really good at this. Nobody is more attentive to this than Admiral Konetzni on the West Coast, Admiral Giambastiani on the East Coast, your type commanders. But there is a struggle here. It's the same kind of thing I've described earlier. It's against the grain of the way we have historically done things. If we are not to meet the fate of Narcissus, we need to come to grips with that. We need to embrace that kind of change.

Finally, a fifth point. I would call your attention to the demographics of this community. It worries me. The most Narcissus-like thing about creating something in your own image, about being in love with your own image, is the continued and continuous existence of this segment of the Navy as a white male preserve.

Now, I recognize that this is a touchy issue, and grows more and more sensitive the more senior and experienced—older—the members of the audience. So I intentionally raise it with this one, where in fact the resistance may be the greatest.

I would say to you that the world is changing in very fundamental ways. I am not animated by some feeling that the Submarine Force cannot operate without women or minorities. The Submarine Force can. It has done splendidly. It could continue to do

splendidly. I am not animated by some feeling of affirmative action or political correctness.

I am animated by the fundamental perception that we are a democracy. The character of our country is changing. As the character of the country changes, so must the character of our military. A Submarine Force that remains detached from the main society and grows further and further out of touch with it is, in my opinion, more and more at risk.

A majority of this country, in 2050, will be what we now call minority. We are today hiring the admirals of 30 years from now when we recruit them. We cannot be out of touch with that change. Congress and political power are changing. More and more we see the role of women increasing in that regard. As that is the case, realistically, if the submarine force remains a white male bastion, it will wind up getting less and less support when it requires resources, when it has troubles—be they accidents or personnel issues or other kinds of things.

It will find itself more and more starved in its recruiting and more and more undercut in terms of the support it achieves for its missions. So, in my view, it is important for the community to come to grips with this circumstance. There are realities here that are difficult—berthing a third to a half of what it might be on a surface ship, long tours with limited privacy... These are real issues. It is still the case, though, that they are ultimately issues that we should be coming to grips with and trying to solve... not today, not this year, but that we should get on a path to recognizing that these are problems and come to grips with them.

Further, looking at the raw statistics, look only at men, this is a community with about a half as many officers who are minorities as the rest of the Navy in percentage terms. This is a community with a third as many minorities who are enlisted; eight percent of your enlisted force are minorities. That's a problem.

Now, in none of these areas, as I described these challenges, do I think we have anything like problems that we cannot surmount. You have two phenomenal advantages. One is your history. Look at that history. I began by talking about it. It is a history, above all, of change.

It is easy to get frozen like Narcissus, admiring the image in a still pool. But the practical reality is that you are in the seats you're in, proud of them and rightfully so, because the people who

came before you didn't stay frozen. That when they had a vision of submarines as scouts and they saw another possibility, they grasped it. When they had a vision of submarines as combatants that eliminated surface warships, they moved along and recognized acoustic warfare and antisubmarine warfare, and they embraced that. They changed again and again and again as, for example, when they embraced nuclear power. We need to be similarly as inventive and capable of changing. That's the message of the history.

Then, second, with this come extraordinary qualities of leadership; 10 percent of the Navy, but you've generated three CNOs in a row... Where did this come from? The answer is it comes from the very core of what makes you submariners, in terms of your qualities. Your leadership, in my opinion, has those qualities. I see it as a terrific advantage that you have at the top of this community people like Admiral Bowman, Admiral Clemins, Admiral Mies, Admiral Fargo, Admiral Fages, Admiral Giambastiani, Admiral Konetzni. You're not going to get better than this. But they need your help in going against the grain of where we've been.

I don't know the answers to each of these challenges in terms of how you get from here to there. But I do know that they're challenges. I know that the trick for this community is coming to grips with them with a kind of openness of mind that will, in the end, deliver for the Nation what you have always as a community delivered, which is incredible richness and depth and dedication and accomplishment.

So I say to you today, look in the pool. Look at how wonderful this achievement is. Then let's jump into this water. Let's create waves and ripples. Let's produce change in how we operate.

Take some risks. You are historically the most risk-taking community of any. You have a brilliant capacity to control risk; witness the way we manage our nuclear Navy. You also are the community that was characterized in World War II by the greatest number of deaths proportionately of any part of the armed forces. One out of 10 of our Pacific submariners did not come home.

If people before you, and you, risk your lives in those kinds of ways, are willing to take your lives in your own hands and take that risk, how can you not be willing to take risks with your careers, in terms of stepping out and saying, there are better ways

to do things?

I ask you, above all, to take that risk for the best of all possible reasons, which is your community and your Nation needs you to do that so that the submarine community of the 21st Century will be the equal, or maybe even the better, of the one in the 20th Century. I give you that with great admiration and much sincerity and conviction from my end.

Thank you.

Question and Answer Session

Q: Are you saying that you support women being introduced on submarines?

A: I think the answer is we need to figure it out. I don't think there is a given resolution here. But I think it's a very important question. I think we really ought to come to grips with it from the standpoint of how can we make this work, can we make this work? I think that will take some time and probably will require different configurations and so forth than we have now. Maybe the answer is sometime off in the future... but I think we ought to try and figure that out and figure out where and when that time is and how we get there.

Q: As a follow-up question, I'm curious if you've had any exchanges with your Scandinavian counterparts, who have had women on submarines, including, I believe, two women in command of submarines?

A: I have not done that. I don't want to project an impression that I have a kind of holier-than-thou view about hey, I know the answer here, or indeed, that anybody does. Australians are another example you could posit.

I do think, though, that this community has a history of coming to grips with issues when they're presented in a clear and forthright way. I think this is an issue. I think that it's not one that we should bury or put aside. I think we should think our way through it. That will involve, as your comment implies, learning from people who haven't done this to a level of success we'd be pleased with, and it will imply learning from others.

But look what's happened. The surface community and the aviation community both had fundamental questions and challenges about the evolution they went through. There were very good arguments in those communities that, in one way or another, the introduction of women or, for that matter, increases in minority recruitment, would pose problems and wouldn't work. We made them work. Now, do you want to be left behind?

Q: Mr. Secretary, would you comment on the evolving support on the Hill for current and projected requirements for submarine building?

A: Yes. My sense is that the requirements for submarines now have—I'm sorry, are you talking about the end state requirement or construction rate?

Q: Both.

A: My sense is that the present theory that 50 submarines is an optimal requirement for attack submarines gives us something to steer by now. I think the great achievement of recent time, a number of admirals, led by Admiral Bowman and a lot of people beneath who are not admirals, of finding ways to extend submarine life gives us the ability to explore alternatives that might generate larger numbers.

As you and many people in this room know, there are requirements studies going on in the Joint Chiefs of Staff that are trying to reassess whether a larger number is warranted. Also, a number of us are very interested in the question of the conversion of Tridents to land attack, TLAM-carrying submarines. I think that will come to fruition as an issue over the course of the next year or two.

My guess is the submarine requirement number, along with a lot of other requirements, will finally get looked at afresh in the next QDR. That's when we'll really come to grips with this issue.

But I see a lot of possibility in both the economies realized and in the Trident conversion idea.

Q: Mr. Secretary, your office is primarily concerned with personnel issues. I guess I have to ask you back, are you pushing

the type of recruitment at colleges where some of these minorities and so forth go or are we still just recruiting, as a group, as you say, primarily all white males?

A: That's a wonderful question. Good for you for asking it. In general, by the way, good for you for pushing back. A lot of my experience in office has been constantly being reminded that I don't have the truth... A number of people are willing to do that. They always began by saying, "Yes, Mr. Secretary," and then they go on to explain why they really mean no.

But the question about recruitment is fundamental. The answer is yes, we have been trying, and I think with some significant success, to improve the character of our recruitment, both in the Navy and in the Marine Corps, and broaden our sources of where we go, the character of our advertising and those kinds of things.

When I began this some years ago, the recruitment numbers for our officers were significantly lower than they are now. We found all kinds of ways in which we were getting things wrong. The Marine Corps, for example, used to run a rather successful ad, in which they had a white knight capturing another piece of the chessboard. It really generated all kinds of leads in terms of people calling in. It's not a very good ad, though, if you want to recruit black men.

We keep noticing ways in which we could advertise in publications that give us a bigger draw for minorities. This isn't easy. It's an uphill struggle. One of the reasons we're less represented in the officer corps is that not as many blacks have degrees in engineering, or nuclear engineering, in percentage terms. It's not as high a percentage as in other communities. That makes for more difficulty.

But I'm not inclined to look at the difficulties and say, gee, we've got difficulties, and walk away from it. The reason that I'm not is because I think it's fundamental to the well being of the Submarine Force. What I'm concerned about doing is protecting this force. Thirty or fifty years from now, if it hasn't come to grips with this problem, in my opinion, it will be at risk. I don't want it to be at risk. We need to act now if we're going to avoid that risk 30 years from now.

Now, it entails 100 different initiatives in terms of recruiting - where we give our scholarships, what kinds of things we do in our

advertising, as your comment implies, the schools we go to, et cetera. We are working on those, and we can beat it. What I'm struck by, though, is when you get done with all that, disproportionately often, minorities are going to the other communities. This becomes self-fulfilling, because obviously to the extent you don't have a critical mass or you're under-represented in a particular arena, then there's a tendency not to move to it.

I think we need to talk about that, come to grips with it, and, in my view, change it.

Secretary Danzig: I understand that it's time for me to leave. But I want to just come back where I was in the course of my comments. No community is stronger than this one in terms of the quality of people within it. No community is stronger in terms of the quality of leaders that you have. No community is more technologically endowed. No community is more protected in terms of its platform.

I spend a fair amount of time worrying what a world of GPS, of satellite observation systems, of precision-guided munitions does to the vulnerability of our airfields or our surface fleet. You have the potential for exerting, in the future, wildly disproportionate influence, just as you have in the past. I think the risk to you is only that you need to get your own house in the most energetic kind of order.

You need to come to grips with your areas of weakness, where those areas of weakness are the flip side of your strengths. You need to work from those strengths to not fall in love with yourselves, Narcissus-like, but instead to reach out and generate the same kind of reforming zeal that your predecessors had. That's something that all of you need to do. It can't just come from the Secretary and it can't just come from the admirals I've mentioned. It needs to come from every one of you.

I wanted to say this to this group particularly, because it needs to come from the retired community, as well. The biggest risk from retirement is the idealization of the world that you had. The people before you didn't do that to you. Or if they did it to you, you overcame it. You need to not do this to us.

We need, together, to work through a new submarine force, and build it as strongly and as wonderfully as you built the old one.

Thank you.■

## AWARDS LUNCHEON ADDRESS

*by VADM Daniel T. Oliver, USN*
*Chief of Naval Personnel*
*Naval Submarine League Symposium*
*June 4, 1999*

This is a real privilege for me to be here, and quite an honor to have been invited. I have to tell you there are a number of reasons for me to be intimidated up here. My former boss, Admiral Trost, is in the audience. My predecessor, Admiral Bowman, is in the audience, as is Admiral McKinney, who keeps a good eye on me from the Navy Memorial. I have Carl Schmidt here, who's straightened me out more than once or twice in several areas of responsibility. Even though I have spent two or three decades in my life as an anti-submariner, I've never seen this many submariners in one place. In my career, and some of you have heard me say this before, when I've had the great privilege of traveling with Admiral Trost, and Mrs. Pauline Trost, Admiral Trost would introduce himself as a submariner, and I from time to time I would introduce myself as a anti-submariner. Admiral Trost pulled me aside quietly one time and said, "You know, you really ought to introduce yourself as a Marine." I looked a little perplexed and he said, "because you go around looking for a few good men!" That was pretty good!

Anyway, to get over the intimidation factor, you gave me the courtesy of the longest lead-time I've ever had for a speaking engagement. Admiral Cooper, I appreciate it. I've had a lot of time to prepare, and my staff to prepare, and so they did. And to borrow a line from Admiral Boorda, they prepared a very nice talk for me, the substance of which was exactly what I would like to address. But I'm not going to do it from the prepared text because, first of all, they are subjects that I am very familiar with, and on the other hand, I don't want to go over the allotted time here.

I'd like to talk about four things as the post Cold War draw-down comes to an end. And these four things are the things that I am involved with on a daily basis. They are recruiting, enlisted retention, officer retention, and then some issues that mark or are related to what I see as the end of a rather remarkable decade.

If you think for a minute about this decade, 10 years ago the Berlin Wall started to crumble and the Cold War was coming to an

end. At that time the Navy was in the headlines for the Iowa investigation. In fact, we recently had the 10-year commemoration of that event. In that decade, it has been pretty turbulent. We had a little bit of an interregnum in terms of the drawdown with Desert Storm, where our efforts were focused somewhere else. But since that time, it's been quite a cascade from trying to get to the 600 ship Navy, and we never quite got there. The Berlin Wall fell, and all of a sudden we were headed to the Base Force, then the Bottom Up Review Force and then the QDR force. All targeted the end of an era, but we were not quite sure what the next era would be.

From the Navy personnel standpoint, we've reached the end of that drawdown. We are now at slightly under 370,000 active duty men and women, which is a significant drawdown from the 600,000 or so that we had when the Berlin Wall started to crumble. We are going to stay at about 370,000 active duty sailors through our program through '05. We're talking about that range. It may trickle down a little bit, or it may trickle up a little bit, but this is a steady state opportunity that we have not seen since the beginning of the all volunteer force in 1973 when we were downsizing after the Viet Nam war. We downsized until we got hollow, the Reagan years of drawing up to the 600 ship Navy never got there, the Berlin Wall fell, and we've been drawing down since. Here we are 10 years later.

That's the drawdown piece of it, but some other things happened. Not only was 1991 the Desert Storm Era, but we also had Tailhook, which got us on the front pages for a different reason. While we were dealing with the repercussions of that, we had the repeal of the combat exclusion law that allowed us to integrate women in much larger numbers into our combats ships and aircraft. These are social kinds of changes that affected a lot of our people policies. At the same time we were in a drawdown that kept getting steeper and steeper, year by year. We had the "don't ask, don't tell" thing that we went through. We had hazing policy questions that were raised. All of these things had to be dealt with by the leaders during that 10 year period, all looking for when would this *be over*. Well, *it be over*.

From the standpoint of active duty Navy men and women, the drawdown is over...it's the end of the 10-year drawdown. Now what are we going to come into? We don't know. Somebody the

other day said we don't know what this period is. We know it's post Cold War but we don't know what it's *pre*. We don't know what it's in-between. But from the standpoint of military personnel, we know that we are entering the new millennium and at least a few years of a steady state in terms of manpower. That means we've got to do some things differently from the way we've done them before.

I'll start with recruiting. As many of you know, we have not made the recruiting goal that we established for ourselves at the beginning of the year, in any year since the drawdown started. For most of those years of the drawdown, that was okay because when we started out, we said this is going to be our goal and we put our resources in place. Then the 600 ship Navy got changed to be the Base Force Navy. The Base Force Navy got changed to the QDR, and the QDR to whatever. We were always able to reduce the number we said we were going to get. As a result of that, we kept reducing our recruiting resources and reducing the number of folks we had to bring into the Navy.

Last year we got caught. We got caught because we had an end strength floor and a number we wanted to meet, but the old downsizing culture of our organization caught up to us. We found that we didn't have the resources in place at the beginning of the year that we needed to recruit the numbers of folks that we needed. And, oh by the way, for the first time in a long time we couldn't cut accessions during the year because we'd done too much of that for too long. We missed our recruiting goal by 7000, although we only missed our strength by about 4000. After you do that for a bunch of years, you end up with not very many young people onboard your ships. That's a problem.

This year, I'm pleased to report that on the enlisted recruiting side we're going to be able to recruit to numbers that we need. Now how did we do that? We have over 4,800 recruiters in the field today. We started this year with slightly less than 3,300. It was not easy to get that many people in a short period of time out in the recruiting force, but that's the price of recruiting in this day and age. We doubled our advertising dollars from 35 to 70 million dollars a year. Those dollars are now in our program at about that level through the rest of the program. We are also reopening most of the 200 recruiting stations that we closed in a decade of downsizing. This was one of among many decisions that we made

in a downsizing environment when you have a different approach to how you have to sustain a force than you do when you're at steady state and not looking for opportunities to try to incentivize people to leave. Recruiting today on the enlisted side is expensive, it's difficult, it's very challenging, there's a lot of competition, but we can do it. I don't lose sleep over it anymore. It's just a matter of getting the resources right. We offer lots of opportunities for young people today, and I think we'll continue to offer competitive opportunities. It won't be as cheap as it has in the past, and we will have to keep it resourced like we didn't have to do in recent years.

On the nuclear side of the house for enlisted, we are doing just fine. We get a tremendous amount of help, I mean this in a very positive and constructive way, from my predecessor, Admiral Bowman, and the entire leadership of the submarine community. I very much appreciate it. I wish the other communities were as far ahead of the problems in terms of recruiting and managing programs. It's been very gratifying to me because every time we have a problem that comes to my attention, it comes with solutions built in. I've been very grateful for that.

On the recruiting side from the submarine standpoint, where we will fall short this year is in officers. The only officer program where we will fall short in recruiting this year will be NUPOC, and those will be the NUPOCs recruited by the recruiting command. We've fallen short every year for the last eight years. This year is no exception. We'll be about two dozen short. Next year we're more confident that we will be able to make the numbers but we're working it all together. Nevertheless, that's the way it stands today. So, in short, in recruiting, again, expensive, difficult, challenging, doable. Both officer and enlisted.

On the retention side, I do lose sleep. After 10 years of downsizing, most of our men and women in uniform, most of them, have not ever been in a Navy that wasn't downsizing. It looks sort of like a company going out of business. When you're in a company going out of business, and you look around on any given day in an economy that has four percent unemployment, you see 16 million employers looking for people to come work for them. Then it's awfully hard for us to convince our young folks to have trust that we are not going out of business. We are having to examine our policies across the board. On retention, what does

it mean when I say I lose sleep over it? I lose sleep over it because I know it's expensive. I know it's not just the money, but I know it is also the money. So we are putting some money behind retention. I'll talk first about enlisted.

Enlisted retention first term is 30 percent, more or less. At a steady state, to sustain our force once we get to the point where we're shaped properly three or four years from now, we're going to have to sustain 38 percent, first term retention. So that's eight percentage points away, or a 25 percent increase, in the retention that we are doing today. You can generalize about eight percentage points to second and third term as well, because we're also short in second and third term, from what we need to sustain this force. We're going to have to really work on that.

Some of the policies we put in place got us here. For instance, SRB, which is the Selective Reenlistment Bonus that we offered to our folks. It's a variable bonus. It can be big bucks, $50,000 or so, for some highly technical skills that we want to reenlist. During the mid to late '80s, up to 40 percent of all reenlistments were stimulated or associated with an SRB. During the downsizing we were able to turn that valve back and we got down to less than 20 percent of our reenlistments stimulated by SRB. We have a pretty ambitious SRB program in place now, and we will ramp SRB up dramatically over the Navy program to get back up to that 40 percent level. I believe, that that will go a long way when it's combined with the other retention incentives that are on the Hill, and that are being worked at in the fleet, to keep our enlisted force healthy. We're going to have to work at it, and do a lot of other things, but the money part of it, I believe will be there.

When we're talking about what's on the Hill, I'm not going to get into a lot of detail. There's a triad on the Hill that looks like both the House and the Senate are going to pass. It's a pay raise, it's a pay table reform, and it's a repeal of the REDUX retirement, or the 40 percent at 20, back to 50 percent. There are some variations in the different proposals on all three pieces of the triad, but we're fairly confident that all three will be addressed in this session of Congress.

There are a couple of other things that are specifically as important. Bonuses are a lot less money for the Navy, about 40 million dollars a year that we're looking to plus up. These bonuses are the Selective Reenlistment Bonus plus up, and also the bonuses

in our officer programs which are every bit as important as the triad. If we get a 4.4 or 4.8 percent pay raise and pay table reform, and the REDUX repeal, and do not get these bonuses, in my opinion, we will not have done enough to stem the hemorrhage in retention. I believe we have to have the bonuses, and we've made that point every time we've gone over to the Hill. A bonus for instance for a young Surface Warfare Officer of $50,000 doesn't sound like much on top of an eight billion dollar triad across the board pay raise, but that $50,000 bucks in the pocket of a Lieutenant is a lot of money. That $50,000 SRB in the pocket of a first class petty officer is a lot of money. So we've got to get the money in the right pockets, and that's why we always say when we're asked, "how important is it the triad?" we always say it's absolutely important, and just as important is that we pass these bonuses that go along with it.

On the officers' side of retention, I'm not concerned too much across the board, because the data show that our Restricted Line and Staff corps are in pretty good shape. There are a lot of reasons why that might be, maybe related to the culture, maybe their job didn't change that much, I'm not sure. But the truth is, we're not having much of a retention problem. Supply Corps a little bit, but the others are fairly healthy. It's the Unrestricted Line where I lose sleep. We are not where we need to be in submarine officers, in surface officers, in aviation officers, or in special warfare. All of those retention numbers are below what we require. Because of that, we're going in asking for special bonuses this year on the Hill, including an enhancement in the nuclear officer bonus. We're confident that will be approved.

We're going into a fundamental revision of the way we pay aviation bonuses, and then we're proposing two new bonuses, one for surface warfare officers, the first time ever, and one for SEALS, first time ever. These have all been passed by both the personnel committees of the Senate and the House, and they'll go to conference. We're confident that we'll get those out. That will go a long way to addressing the trust factor, because, quite frankly in this day and age, even though they say it's not the money, we know it's not just the money, but it's also the money. How we tell people we value them has a lot to do with how we pay them. We think it's important that we keep faith with these bonuses. The practical fact of the matter is at this point, the expectations are so

high, if we don't come through, I believe retention will get worse, and not even stay where it is today. Nevertheless, you have to wonder about retention and why it's the URL that we have the problems with and not the Restricted Line and Staff...it's something to think about.

I'd like to just mention a few of the other things that either sort of mark the era, or the turning point where we are in the draw-down, or the change or symptoms of the things we want to work on. We're getting pretty close to the end of the Tailhook era. We will not have any active duty officers that we will be sending forward for confirmation to the Senate, that were "potentially implicated by Tailhook". There were 120 of them, you may know that, and we're done with the active duty side. No reserves will come up for Senate confirmation until 2005 at the earliest, so we're pretty much done with this. It's been a long, long time, but what this means is with that sort of detail out of the way, the certification process going away, it's now the time, as the Secretary and the CNO have both suggested, that we can open a dialog and speak to the possibility of reconciling the relationship with the Tailhook organization. The pace of that, and how that all takes place is above my paygrade. But it marks the end of an era, a very difficult one for many.

Enlisted advancements are up, a serendipitous outcome of the way we downsize and kept faith with our career force. Our force is slightly misshapen, but the way it's misshapen means that enlisted advancements will continue to get slightly better over the next several years in the aggregate across enlisted paygrades. We continue to work some of the initiatives that were put in place from our predecessors. Homebasing continues to be a cultural thrust that we push. Sea-shore rotation is something that we continue to work on, trying to get the Navy stabilized from the chaos of the cascade. Our readiness accounts are fully funded. Our PCS account, through 2005, the Navy's program, is fully funded. Tuition assistance; the TEMDUINS account; our end strength; our Selective Reenlistment Bonus; our Quality of Life accounts; our MWR to DoD standards; all of these are fully funded across the board through 2005, the end of the FYDP.

I know the Secretary was here yesterday, I know a couple of things he talked about, I don't know whether he talked about zero defect. There was a zero defect perception out in the fleet. We

have a zero defect mentality, that we have been too tight in terms of zero defects. My diagnosis is that as a result of rebounding from Tailhook, we put in place policies and expectations that we were allowed to execute in a downsizing environment. Our culture is wonderful because it adopts leadership and direction. That was the right thing to do for the time. But like all things, it too should pass. We got to a point where the perception out in the Fleet was that we were too zero defect. Secretary Danzig has made it one of his conscious agenda items to address that mentality, and I can tell you that there is not a zero defect reality out there. There may be some lingering perceptions. But we are moving promotion boards through a lot faster today, and there's a lot more forgive and forget in the way we're approaching all of our centrally controlled selection advancement programs.

When I look around at the policies I can find that in the last decade a decision was made to move that policy towards a throwaway environment, or a downsizing environment. I'm talking attrition policies, recruitment policies, early-out policies, admin discharge policies, NJP policies, almost every policy, if you look at it hard you can say, "I bet the background there was that they needed to get smaller and didn't want to RIF people," and that's true. We're having to go through methodically and think about walking each of those things back.

We have one significant misshape in our force and that's a divot. We have a big divot in our Unrestricted Line Officer corps. We under accessed in the early 90's. It was based on good faith expectations of the size of the Navy. It turns out we're going to be larger than those expectations were able to support. So we under accessed in the early '90s, about '93, '94, '95. Those were decisions that would have been made 2 to 5 years before that. That applies to aviation, the famous *T* notch that we have, but also in the other Unrestricted Line communities. So we under-accessed, we are under-retaining, and for one other reason we are going to end up in a couple of years, with a lot less 04s, 05s, and 06s in the Unrestricted Line than we'll have requirements for. The third reason is a little bit arcane, but I'll explain it because it's important. When we downsized from the 600 ship Navy, the battle force came down 40 percent. The infrastructure only came down 19 percent, or about half of that. The way we buy Unrestricted Line Officers, or always have bought them, is that we look at how many

we need for Department Head. Then we project the retention to Department Head, and we buy that many billets. Then we figure how many will make it to Department Head, and then when they go ashore, they fill out the infrastructure. Now, our battle force Department Head requirements don't support that infrastructure that is not proportionately as small as the battle force. We're going to have a gap to 04, 05, and 06 grades that will get serious in about two years, then it will take about three to four years to work our way through that. These are problematical, if we don't get our retention up, then that will mean it will be a lot worse than what we are projecting, because we are projecting it at the steady state for retention requirements that we hope we're going to get by virtue of these bonuses and other kinds of things. That's a problem for us to deal with.

Beyond that, for the officer's side, in the longer term we need to think about what it really means to be unrestricted warfare, what it means to be a naval officer, in whatever era it is, after the post Cold War era. There are some cultural things we may want to address. I think in the Navy and the Marine Corps, we had less cultural change to deal with, perhaps than the Air Force and the Army. They are moving more from a garrison type of mentality to expeditionary, but still we have some cultural issues that we need to address.

On the enlisted side, and this is my last comment, the most important thing I think we need to deal with there is our distribution system. Our distribution system, still, after all these years, does not have a placement function in place. We don't do individualized career planning in the distribution process for our enlisted sailors. We need over time to build a process to treat our enlisted sailors like the individual professionals they are instead of the commodities that we've been treating them like when there was a conscription force. We've been in the all volunteer force now for 25 years and it's time to model our programs to treat everybody better.

That brings me now to the end of my prepared remarks, again I thank you very much for being here.■

## ADDRESS TO SUBMARINE TECHNOLOGY SYMPOSIUM

*by Dr. Paul Wolfowitz*
*May 11, 1999*

*Dr. Paul Wolfowitz is the Dean of the Paul H. Nitzi School of Advanced International Studies at Johns Hopkins University. He served previously in Federal government in a variety of capacities; in the Arms Control and Disarmament Agency, including serving as the Special Assistant to the Director of Strategic Arms Limitations talks; he's been Ambassador to the Republic of Indonesia; he's been Assistant Secretary of State for East Asian and Pacific affairs; and from 1989 to 1993 he was the Under Secretary of Defense for Policy. He assumed his duties as Dean of the School of Advanced International Studies on January 1, 1994.*

I know that the topic of your symposium includes the word innovative and what I'd really like to talk about here today is what I believe is the importance of innovation and possibly the understated importance of innovation in this extraordinary time in which we live. The theme of my talk today is that we have a very difficult job balancing the requirements of the near-term, the medium-term, and the long-term because I don't remember a time, at least in my career in our post-war military history, when I believe there has been such a dramatic difference between the three different requirements. It is my concern that we may be, not surprisingly, much too focused on the near-term at the expense of the long-term. Now again that is shameless pandering because you folks are looking at the long-term as you must, and I hope you'll keep it up.

There are many things that are remarkable about the era that we live in, and I never thought I'd live to see the day when the Soviet Union collapsed, I never really thought I'd live to see the day when Arabs and Israelis, or Israelis and Palestinians specifically would be signing peace treaties with one another. I never even thought I'd live to see the day when countries like South Korea would become democracies. We really live in a quite extraordinary time. So extraordinary that I think we've begun almost to take some of that for granted. But I would like to underscore two things about the time we live in that I think are both very remarkable. Each one is remarkable. But the two taken together present a kind of

paradox.

One fact of our time is the overwhelming predominance of the United States as a world power. Not only as a world military power but as a world economic power, a world political power, indeed I guess the French would say even as a world cultural hegemony. The United States is dominant in a way that probably no country has been on the world scene since the Roman Empire. But we're not an empire. And in fact, part of this very dominant American position is that not only are we the predominant country but the strongest other powers in the world, particularly the strongest economic powers in the world, are all our allies. And it is really impossible in the past several centuries to find a period of time when one country was not only so predominant but that it was allied with all the other principal powerful countries in the world. It puts us in an unusually secure position. I think because of that, we are in a period of history when it is almost inconceivable that any major powers would go to war with one another in the near future. We can have an incident like the bombing of the Chinese Embassy in Belgrade and a great deal of tension, but I don't think anyone thinks for a moment that this is going to lead to a war between the U.S. and China. Major war between major powers, which has been a common experience, unfortunately, of this century, is something that we really don't have to fear today.

But the second thing that makes this period of history so extraordinary is it is a period of enormously rapid change, enormously rapid economic growth. Economic growth that is so incredible that it is generating new powers on the world scene that we really didn't think about in the recent past. Many of these new powers are in Asia. Korea is already emerging as an economy, when it rebounds from this economic crisis it will begin to be something like half the size of Japan. A unified Korea is a country that would be comparable to the major powers in Europe. In Korea, again, when it recovers, and I think it is recovering already, will be well on the way to catching up with the advanced countries of Europe. And yet Korea, by Asian standards, is a medium size power. In fact, the most impressive growth in the world is in the world's biggest country, namely China. And projections of China's economic growth make it plausible that within 25-30 years China will emerge as an economy equal in size to that in the United States. A country comparable to us then in economic power

without the kinds of inhibitions that Japan and Germany today have on converting that economic power to military power. And therefore within what is a relatively short period of time by historical standards we could go from a situation where the United States enjoys a kind of overwhelming predominance in the world to a situation where we actually, once again, face a superpower of comparable size and comparable strength. But one hopes not of comparable enmity of that of the Soviet Union. But the political relationship is something that is very hard to predict. It is really extraordinary then to go from this period of history where we are so predominant and to move so rapidly to a period where we could face major shifts in the world. China is not the only country that can emerge as a major power. India, which, for some reason, we seem to forget about, is a mere 900 million people instead of 1.2 billion; it's only growing at 5 or 6 percent per annum instead of 10 percent per annum. But India, as they reminded us last summer with their nuclear tests, is a major force to be contended with. And then there's a range of medium powers (Iran; Iraq; if it's still around, North Korea) that has shown a determination to acquire weapons of mass destruction and long-range delivery systems, particularly ballistic missiles, that give these medium powers the capability of threatening the United States and threatening our allies in a way which in the past we did not concern us. And I think it presents a great intellectual challenge to think ahead from this period of relative American predominance and relatively remote threats to a world in which we may face a much more insecure situation with stronger competitors and with some particularly dangerous countries acquiring nuclear weapons. I think in facing that we find ourselves, in my view, sort of straddling three different views of defense planning.

The one view seems to be to be focused on the present, and on the idea that threats are remote. That the real problems in the world are kind of the residue of history; the ethnic conflicts that we see in the Balkans; or what we see elsewhere in the former Soviet empire; to some extent in Africa, or in Haiti, and the real requirement for that then is not military force in its traditional form but military force for the purpose of peacekeeping. That focus on peacekeeping, and the enormous preoccupation with the many deployments that we have to spread our forces around the world to conduct today, makes it very hard for senior military leadership to

focus on a great deal else. Forces that are meant for peacekeeping are forces that have to be trained to a very, very different concept of the use of force. Indeed, they have to think much more about not using force at all. It puts us in the position not of figuring out how we support allies in the conflict, but rather how we suppress all sides of a conflict which is a very different proposition, and it stretches our personnel and our rotation requirements, as we're seeing, to a very, very substantial degree. It is an enormous preoccupation and I believe it makes it harder to look at other possible issues.

The middle ground is the one that is represented by the defense-planning concept of major regional contingencies. I guess I, whether for good or for bad, have to claim some responsibility for that. In fact, when I worked for Secretary Cheney and the Berlin Wall came down he asked General Powell and me to put our staffs to work at what a post-Cold War defense concept would look like. We came up with what General Powell called the Base Force as the concept of a regional defense strategy that would focus on dealing with these major regional contingencies. And I believe we need to do that, but I think there is a danger today that we will get our entire defense establishment focused around how to deal with threats in the Persian Gulf, specifically an Iraqi threat in the Persian Gulf, and threats on the Korean peninsula. Those are important and we have to be able to deal with them. Indeed, in the future we may be forced to deal with them in an environment where either Iraq or Iran or North Korea are threatening us not only with conventional forces but even with the threat of weapons of mass destruction. But I don't believe that is the be all and end all because we have to think about this world that is coming at us, and coming at us relatively quickly, in which there is, once again at least, the possibility of major war between major powers and in particular a world in which there is the possibility of a major peer competitor in the form of China. I think if there's any lesson in looking at defense planing over the last 50 years or 100 years one shouldn't get too confident about predictions that are 15 or 20 years away. And maybe, the world being a strange place, China will turn into our closest ally and maybe someone else will be the problem, or maybe there will be no problems at all. But if I had to predict today where the problems are likely to come from, I think the combination of emerging power and residual political

grievances suggest at least that China is a country that we're going to have to think about.

That presents an entirely different way of thinking about military planning, an entirely different way of thinking what our military forces are for. In some ways it means going back to thinking about war in conventional form, war as war between major states, not war as peacekeeping. I must say I'm a little astonished that after 50 some days of bombing Serbia we still don't refer to it as a war, it's a conflict. Mistakes happen in conflicts and we're out to prevail in a conflict. It seems to me that's an illustration of how the very concept of war, and winning wars, and fighting enemies who are enemies is to some extent suppressed in our present lexicon. In fact, we face a problem from a super power, China, 20 to 25 years from now then we have to get back to old notions about war as war. War is something in which there are winners and losers. And believe me if you read the literature of the Chinese military today they certainly think about war in those terms. We also have to think about it in a fundamentally innovative way because if major war between major powers reemerges as a defense problem it's going to do so in an era of truly revolutionary technology. It is not going to be the central front of Europe during the Cold War. It's not going to be major armored formations, probably not even the kind of major naval formations that we were so good at putting together during the Cold War and that made such a difference in winning that great struggles. The same kind of revolution in technology that is transforming the commerce, transforming the economy, transforming the workplace, I believe is transforming military affairs. There's a further aspect to this that I think we neglect at our peril, and that is, if one thinks about a competitor like China their task is a little different from our task. People say that China's ambitions in the world are modest, that China has behaved historically in a relatively restrained way with its military power. That may be true, but I think what China can be counted on to care about is who rules China's neighborhood. That for a Chinese planner, for a Chinese military planner or a Chinese political leader, the idea that the western Pacific should remain indefinitely an era of America preponderance is something that is abnormal in their view of the world and I think it's not surprising that it would be something they would want to reverse. For them it is not necessary to

become a global competitor of the United States, it's simply necessary to become the regional equal or regional competitor of the United States. For them it's not necessary to be able to project force 10,000 miles from home, it's necessary merely to prevent us from projecting force 300 or 400 miles off their coast. It is, to use one of the current buzzwords in the defense planning business, in its essence asymmetric warfare or asymmetric competition. And that means we have to be particularly innovative if we're going to stay ahead in the race where the other side has, in effect, a kind of handicap or a kind of head start.

In saying this I'm not trying to predict some kind of inevitable conflict with China. I spent a lot of time working on U.S./China relations. In fact I was Assistant Secretary of State for East Asian affairs back during the Reagan administration working for George Schultz. I'm kind of proud to say there's a book that came out not long ago by Jim Mann, a distinguished diplomatic correspondent for the *Los Angeles Times*, called About Face which is the history of U.S./China relations in the last 30 years. I think it's such a great book because there a chapter in it called *The Golden Years* and he says the golden years of U.S./China relations were the years when George Schultz and Paul Wolfowitz were running U.S./China policy. The essence of what he describes, and I think it's correct, is that Schultz understood the importance of good relations with China. He wasn't out to create problems with China. But he understood that the key to a good relationship with China lay not with Beijing but in the capitals of our allies, particularly Seoul and Tokyo. And that from a Pan-Asian perspective, a perspective of working with our allies in Asia, it was possible to achieve a much better relationship with China. I think the history of that period bears it out. Once the Chinese had tested Schultz and Reagan and discovered that there were distinct limits to how far you could push them they stopped pushing us. The Taiwan issue began to be quieted down. In fact it was in that period that one of the great breakthroughs was achieved when China joined the Asian Development bank and Taiwan remained as a member. To this day it is one of the only instances where China and Taiwan exist as members of a single international organization. So I believe in the importance of good relations with China, and I believe good relations with China are achievable. But I don't think they're going to be achieved simply through a kind of mindless process of

engagement. Sometimes we're told the alternative to engagement is isolating China. I don't believe in isolating China. If that's the alternative then I guess I believe in engagement. Sometimes we're told that the alternative to engagement is containment. If containment means containing China the way we contained the Soviet Union, it means engaging in a Cold War with China. I don't believe in that either. But sometimes I wonder what people think the alternative to containment is. Is the alternative to containment sitting still and accepting Chinese expansion? Is the alternative to containment allowing a Chinese military umbrella to extend itself perhaps first over Taiwan, then over Korea, then over Southeast Asia and the Spratly Islands, and then eventually even over Japan? I think that would present a situation that is intolerable for American security and intolerable for our allies in Asia. So therefore I believe that military competition with China, successful military competition with China, is an important part of maintaining a peaceful relationship with that great country.

I think eventually we'll find the political relationship with China becomes easier as China evolves itself politically. There's a kind of dramatic illustration of that today. I've been fond of saying that a Chinese government that uses force against its own people is a government that will be much more likely to use force against its neighbors. In a small way I think you see that in the demonstrations outside the American Embassy in Beijing which have a decidedly staged quality to them. Not to say that there aren't Chinese who are genuinely angry and upset about what's happened. The fact that the Chinese government has stirred up this feeling, I think is due in some measure, to China is trying to divert attention from its own problems and, in particular, divert attention from the coming anniversary on June 4 of the 10th anniversary of the Tianneman incident. As one wit put it, "apparently the Chinese government considers they are allowed to kill Chinese people and we are not." Well, there's a problem in China today. The Chinese Communist Party claims to govern China on the basis of Marxist/Leninist doctrine, but nobody in China, including the leaders of that country, believe in Marxist/Leninist doctrine anymore. It would be sort of as though Queen Elizabeth claimed to govern England, and of course she doesn't claim to govern England, on the basis of the divine right of kings. A government that lacks any real basis for legitimacy is a government that has real problems.

A Chinese communist once came to me, a professor from a university where we run a cooperative program, came to interview me about my view of U.S./Chinese military relations. I gave him a very benign account, much calmer than what I gave you this afternoon and I said "Look, we're really not trying to create enemies, we hope China's not going to become an enemy. In any case, China's so weak today," I said, "we're really not worried about China." Then he put his notes away and we started to talk about politics. The man, as I say, had identified himself as coming from the Communist Party and writing for a communist publication and I didn't want to be too critical about his government so I said, "I believe in a democratic future for China but I certainly understand that there are Chinese who believe that if you move too rapidly towards democracy that China will become unstable, that China may not yet be ready for democracy." And this man, professor from a university in China, practically jumped out of his chair and he said, "China's ready for democracy. It's those old men in Beijing," he said. What terrifies those old men in Beijing, and this was a few years ago, is next year Taiwan will have a democratically elected president. Now I don't know how universal a view that is in China but I find it very interesting that it's not just limited to dissidents, but you find it even among members of the Communist Party. This is a country that really has not sorted out its political future. And in that picture there is the great danger that lacking any other basis of legitimacy China could turn to nationalism as a source of legitimacy. I think the United States has to be very careful not to lend fuel to that flame, not to make that situation worse. I think we see in the demonstrations outside the American Embassy today a small inkling of what that might be like.

On the more positive side, I also believe it means there is a great deal of hope that China, 20-25 years from now, is going to be a very different China, politically, from the one we see today. I believe it will be a China that is much more inclined to be part of a stable international system, much more inclined to be a China that wants to preserve the peaceful status quo in Asia rather than one that wishes to alter it. But I can guarantee you that any president or any secretary of state who is negotiating with China, whether it is over issues of World Trade Organization, which I believe China should join, or even more if it is about issues that

concern the security and stability of that critical part of the world. would be in a much stronger bargaining position if the Chinese understand that the resort to force is not something they would be successful at. If the Chinese understand that the United States, or at least the United States combined with its allies retains military predominance in the western part of the Pacific. That is an enormous challenge. It would be a challenge if we were prepared to put our entire effort into it. It's even more of a challenge at a time when so much of the country tends to think that that kind of an effort isn't really necessary, that we're talking about something that's so remote that it really can't touch the lives of Americans. But 20-25 years from now is not remote in historical terms. That kind of change, happening that fast has very few parallels in history.

There is one parallel and it's a disturbing parallel and I want to leave you with this one. That is what happened at the beginning of this century. The beginning of the 20th Century was also a period of remarkable peace, not one in which you could dismiss the possibility of war between major powers but one in which, there hadn't been a major war in Europe since 1815. There had been the Franco-Prussian, but even that was 30 years away at the turn of the century. Americans thought about the last conflict we'd been in, the Spanish American War, in somewhat the way we think of the Persian Gulf war today. In fact, when Admiral Dewey sank the Spanish fleet in Manila Bay, the Chicago Tribune headlined it "Greatest Naval Engagement of Modern Times." That was warfare at the turn of the century. And the turn of the century was also similar to our time in its enormous optimization about where the world economy was going. Instead of the information revolution, we had the industrial revolution. But a very similar, huge expansion of the world economy had led people to be very optimistic about the possibility that perhaps war between major powers was a thing of the past. Well of course it didn't turn out that way. The reason it didn't turn out that way is because somehow the international system didn't figure out how to deal with the emergence of Germany as a new major power on the world scene. A country that on the one hand felt itself enormously powerful, which it was, but a country which also believed in the words of the Kaiser that it had been denied its place in the sun, that Germany needed to get respect in the world and the way to get that

respect was through asserting its military power. And the rest is indeed history. It led to World War I, it led through World War I to the Bolshevik revolution in Russia, it laid the seeds of World War II, it turned the 20th century into the bloodiest century in history instead of the most promising century in history.

We're at the dawn of a new century, a century that truly could be the most remarkable and positive century in human history. I believe it's going to be important that we continue to do our job in guarding against the worst possibilities if we're going to prevent them from happening. I believe if we do that job, then we can look back 25 years from now and we'll have to say a job well done. It will be tragic if we have to look back at a world that is full of conflicts that could have been avoided if we kept our guard up, conflicts that could have been avoided if we had maintained our capacity to innovate. Winston Churchill, writing in 1938 about the history of World War I, compared this very calm scene that the world confronted in 1900 with the way the world looked on the eve of World War II. And he said, "The scale on which events have shaped themselves has dwarfed the episodes of the Victorian era. The small wars of that era between great nations, its earnest disputes about superficial issues, the high keen intellectualism of its first images, the sober, frugal, narrow limitations of their actions belong," Churchill said, "to a vanished period. The smooth river with its eddies and ripples along which we then sailed seems inconceivably remote from the cataract down from which we have been hurled and the rapids with whose turbulence we are now struggling." I believe to avoid confronting ourselves with a situation of similarly dramatic change it is important that we maintain our ability to change militarily, that we maintain the preeminence that the U.S. and its allies enjoy today. I believe that is something that can't be achieved except with real effort and real innovation. So keep it up and we'll check back in 25 years.■

## U.S. SUBMARINES IN THE NEAR FUTURE

*by Dr. Paris Genalis*
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Admiral Smith, thanks for that very kind introduction. To everyone assembled, thank you for your kindness. I can only say that your warm welcome leads me to believe that none of you work in the Pentagon. I noticed, as I'm sure all of you have, that the naval officers outnumber the civilians on this panel. This makes me wonder why Bill Smith invited me to participate: either he values the unique perspective I will offer, or, more likely, he believes I'll make the Admirals look good.

While Admirals Fargo and Fages have spoken eloquently about preparing the future battlespace, the only battlespace that I'm qualified to speak of is the Pentagon. I feel confident in saying it's far less chivalrous than the environment my fellow panelists have discussed. And believe me, the battle that we are currently waging in the Pentagon will have a profound impact on the future of our Submarine Force and the security of our nation. The Navy, like the other Services, has begun to prepare for the next Quadrennial Defense Review.

Let me begin by giving you my personal perspective on how we got *here*, to a present-day force of 58 attack submarines, with a target of 50. I always get a chill when I hear someone speak of the QDR's finding of 50 submarines as if it came down from the summit cast in stone. The reality is that the QDR was the best compromise that could be developed under the fiscal constraints of the Department of Defense.

Based on Navy and OSD analyses, 12 carriers were deemed necessary. Analysis performed in previous years indicated a continuing need for 12 ARGs and 110 to 116 surface combatants. Then, the work of the 1993 Bottom-Up Review was consulted, which resulted in a range of 45 to 55 submarines. Starting with these data points, both Navy and OSD agreed to a Submarine Force level of 50 as a target. But this left open another question. Since 50 is a target, is it an upper limit, as some would consider it, or is it an absolute minimum, as the submarine community would like to believe? Concern was sufficient that the QDR also said the number of submarines is contingent upon a re-evaluation of requirements.

Another input to this debate is the Defense Science Board's Report on the Submarine of the Future. This report gave us a simple but elegant statement: "We need more, not fewer SSNs." No one has credibly challenged the DSB's findings.

But then, the statement isn't spoken as often nor from as many different sources as we would like for such a powerful sound bite. Let me say that I'm glad Admiral Bowman emphasized it in the latest edition of *Undersea Warfare*. By the way, I encourage everyone to read the Admiral's article, if you have not done so already. I assure you that it will be time well spent.

The DSB's "more, not fewer" actually has some substance because we can quantify it. A recent employment study from the type commanders expressed a requirement for 72 boats. In this context, the QDR's 50 should not be considered a force level we hope to achieve, but an absolute floor. Current defense plans say 50, just like the QDR. And also like the QDR, the defense plans say the number is contingent upon a re-evaluation of requirements. Dr. Hamre, Deputy Secretary of Defense, commissioned the re-evaluation study last year, led by the Chairman of the Joint Chiefs of Staff. This difficult work continues, so it is neither possible nor appropriate for me to predict the outcome. However, simply the fact that there is such a study confirms the existence of a potential issue with Submarine Force levels. But it's no secret that the submarine community hopes the study will draw the same conclusions as the DSB, the recent employment study that I mentioned, and the judgement of the Submarine Force leadership, all of which are calling for more than 50 boats.

If this happens—a big if, indeed—a giant hurdle will have been crossed, but don't for a moment believe that the race is won. This is because a very, very tough dilemma is waiting to present itself: how, within available but highly constrained resources, would the country build a larger force of capable and affordable submarines? Believe me, if the country does not see a need for more submarines, then the country cannot afford more submarines. So let me discuss the two traits I mentioned, capable and affordable, in search of some answers.

As the decision-makers consider whether we need more submarines, I am concerned by the fact that other communities perennially view the Submarine Force as threatening their programs and their warfare expertise. This is very dangerous. When a threat is perceived, the Pentagon way is to seek consensus, which implies compromise, which may lead to results that are less than

desirable—fewer submarines.

As an example, many people view the Trident SSGN conversion as a competitor to other sea-based power projection platforms! If SSGN is to become a program, then this misperception must be confronted and defused! The submarine community needs to develop and make the case about what SSGN will do that other, already funded forces and systems cannot.

When promoting the SSGN concept—and virtually every other submarine program—the Submarine Force must give the other warfare communities their due. In my experience with all communities' programs, encroaching on someone else's territory is not the way to make your case. Let me be totally candid. I firmly believe that:

- Submarines will never render surface ships obsolete. The gray hulls will always weigh in with a larger magazine, greater manpower pool to handle simultaneously so many diverse tasks, virtually perfect connectivity with C4 nodes, and a clear, real time, uninterrupted picture of the surface and air environment.
- Submarines likewise will never replace manned aircraft because aircraft have the man-in-the-loop, all the way to ordnance on target.
- But I also believe that the Defense Science Board was exactly on the mark when it called attack submarines "a crown jewel in America's defense arsenal"—a direct quote. How else to describe a platform with such stealth, endurance, mobility, and versatility, among other attributes?

Having said all that, I must concede that a discussion on these terms is merely academic. Let me illustrate why. As a crisis looms, our President and Secretary of Defense want to know where the carriers are. This has been the case for over half a century. Their interest is not because they are captivated by the carriers' ability to transport a lot of airplanes at 30+ knots. Instead, carriers enthrall them because of the roles and missions they fulfill: presence, power projection, and strike. These are real missions that give a powerful mental image to national leaders—not only ours, but also the leaders of allies—and adversaries.

When I hear talk about submarines, too often we discuss only attributes like stealth and endurance, rather than roles and missions. But you won't hear Dr. Gansler, Under Secretary of

Defense for Acquisition and Technology, say "We need more submarines because we need to have more stealth and endurance", just like he won't ever say, or even think, "We need to buy the next generation aircraft carrier so that a lot of sailors can drive around the ocean at 30+ knots with 80 aircraft on board." Are stealth and endurance worth $1.5 billion, the average cost of the Virginia class? The answer is a resounding "no." But I know what everyone here is thinking—an emphatic "yes." This is because you understand what these attributes empower the submarine to do.

The challenge that must be undertaken is to help the decision-makers understand the utility, not just the unique attributes, of submarines. They need to be shown in clear and succinct terms that the attributes we have painstakingly engineered into our submarines give them the ability to perform a very broad spectrum of essential missions in peace and conflict—making them a bargain.

More specifically, the decision-makers must be shown what every warfare community, every Service, every CINC, and our national leaders rely on submarines to do. I must acknowledge and complement the Submarine Force leadership—Admirals Bowman, Giambastiani, Konetzni, and Fages—for their impressive effort to make these very points, but otherwise I don't think we're doing this very well.

Let me wrap up the discussion on capabilities. Once the focus is shifted to roles and missions as the justification for submarines, then the case makes itself—it becomes self-evident—that our submarines complement, rather than compete against, other platforms and programs for scarce acquisition dollars.

Now let me talk about affordability. I think of affordability as *acquisition appeal*. The more affordable a program is, the more appealing it is to those who make acquisition decisions. A submarine is more appealing if it is simply better, if it can be procured more quickly, and, of course, if it costs less. Let me discuss all three.

First, making submarines better. In terms of acquisition appeal, a better submarine is one that delivers *more bang for the buck*.

- The Submarine Force is so far ahead in commercial off-the-shelf applications with the acoustic rapid COTS insertion, A-RCI, that other communities are asking to borrow your playbook. A-RCI offers both advanced capability and reduced cost.
- Leap-ahead technologies. These must be pursued with gusto

because they present the only path that ensures our Submarine Force will remain the world's best. We must exploit the strategic pause and accept the risk that this pursuit entails.

- The *flexible interface with the water*. This is the DSB's concept for a less *tyrannical* way than the 21-inch torpedo tube to send weapons on their way to the target. The DSB said that we should not consider four gun barrels, or even eight, as sufficient armament for our submarines.
- Advanced weapons. The greater variety of weapons a submarine can deliver, the greater leveraging effect of its key attributes. I believe that we ought to consider strike warfare—land attack—as a submarine core mission, meaning an important reason to buy submarines, and pursue it with all vigor. By the way, the Advanced Land Attack Missile, ALAM, continues to have strong support within OSD. It is within our grasp and I hope the Submarine Force and Navy can demonstrate a commitment to it.
- Other payloads. It's high time for the quantum leap to occur in adjuvant payloads. The surface community proved long ago what adjuvant payloads can do when they put helicopters on frigates, destroyers, and cruisers. Adjuvant payloads aboard the ultimate stealth platform will do even more: they will put the submarine skipper in the harbor, up the river, right atop the battlefield, and many other places where no one would dream of finding a submarine sensor. This will represent a broad and complementary mission niche. DSB opened the door to this concept. I hope we go after it.
- Technologies that will enhance connectivity while preserving stealth and mobility. Connectivity is a problem that submariners must deal with because the assumption will always be that lack of connectivity is the submarine skipper's fault. After all, submariners are the Silent Service. We must continue to pursue technology solutions, like:
  - A more effective bell ringer.
  - An acoustic link for very long range or network applications.
- Rapid information transfer system. Specifically, a protocol-based, asynchronous information transfer system—fancy words that describe the Internet—needs to succeed now. This will be a great enhancement for submarine operations, particularly battle group support, because it will allow the

submarine skipper to get data when he can, not constrained to when the sender transmits.

The data rate we can achieve now is $10^6$ BPS—roughly the limit imposed by a 16-inch dish antenna. While more bandwidth could be useful, some studies indicate that our submarines may not need it. Instead, we need to fully exploit what's already available. Achieving greater bandwidth, greater data rate, is not a real technological challenge—just get a bigger antenna! But this would clearly be at the expense of stealth—a very poor trade.

What can a submarine do with $10^6$ BPS data flow rate? Plenty! Recognize that this is approaching the data rate of a T1 line. The boat could receive two typical TOMAHAWK Mission Data Updates every second; or receive and transmit in one second a high-resolution color photograph that the deployed UAV may produce; or *surf the SIPRNET* for the latest OTH targeting data and intelligence. These examples represent real breakthroughs in connectivity and real enhancements in acquisition appeal. Let's go after what is within our means, rather than covet more.

The second way to improve acquisition appeal is to reduce the time it takes to procure a submarine—cycle time. This is the many, many years that never seem to end between creating the concept and its IOC. Let me offer you two extremes. At one end of the spectrum is the consumer electronics industry, which works within a cycle time of 18 months. At the other extreme are shipbuilding programs with a cycle time of 11 to 13 years, or more. Our goal, our commitment to the Vice President: reduce cycle time by 25 percent—and that's still 8 to 10 years to IOC a class of ships!

The pitfall of such long cycle times is that cost continues to expand as one more technology is pursued so that the future platform can counter one more future threat. If we pursue this process to the logical extreme, we'll never be quite ready to finalize the platform. And cost expands, of course, to fill the vacuum created by runaway growth of requirements and technology to meet these requirements.

One remedy that we are studying to the current cycle time is what Dr. Gansler calls evolutionary acquisition. We need to let requirements evolve just as technologies do, but after the program has been established, after the ship is designed, and even after some ships of the class are already underway. At the start of the program, requirements must be both minimal and flexible. Then we can build a few ships, attack a new increment of requirements,

build a little more, go after another set of requirements, and so on.

We're off to a good start with the Virginia class. As we continue to pursue this concept, we'll expect the last in the class to bear little resemblance to the first. Flights of 688s reflect a simpler version of this concept, such that 688I is very different from 688. But we can do much, much better than this model. That said, I need to acknowledge that cycle time reduction is not a bottomless well of savings and could require additional resources at earlier stages of a program to realize these savings.

For instance, the time it takes the artisans and craftsman to actually build some sections of a submarine hull is not likely to improve much more than it has already. But by having lots of *builds* or *flights* in mind at the outset—when we design the class, we should make the class *redesignable*. And by accommodating evolutionary requirements, every build will involve less complex changes from its parent and will be less prone to complications, unplanned cost increases, and delays. All of these benefits will make the program more likely to win support on both sides of the Potomac.

The third way to improve acquisition appeal of submarines—I saved the obvious for last—is simply to make them cost less. We are already seeing the cost benefits of modularity in the Seawolf and the Virginia programs. We've made use of these concepts in construction, design, and plugs. We can find more savings by designing increased flexibility for introducing and updating electronics. There's more savings to be found by simplifying designs in the propulsion plant and throughout the ship—fewer breakers, switches, pumps, and valves, for example.

I mentioned technology when I spoke of making our submarines better. We can also exploit technology to reduce cost. COTS, which I mentioned earlier, is not just for electronics. Secretary Gansler tells the story of Boeing developing a ground-based interceptor for National Missile Defense that uses a COTS rocket booster at tremendous savings over any alternative. We need to look at COTS for our manufacturing processes as well. Secretary Gansler tells another story about the Joint Air-to-Surface Standoff Missile (JASSM). Lockheed-Martin uses methods developed in the commercial boating industry to make the airframe body and practices of the surfboard industry for building the wings and tail.

By the way, please don't take my comments out of context. If *Inside the Navy* reports that I want the surfboard industry to build our submarines, Admiral Bowman will kill me with his bare hands,

and not a jury in the land will convict him for it! Kidding aside, all of the cost-saving measures that go into JASSM have brought the projected acquisition price of each missile down by over 40 percent while the overall program costs will be reduced by 30 percent— and without compromising capabilities.

Before I wrap up my discussion of reducing costs, I need to touch on how we can benefit by changing the perception of cost. Considering the constrained-budget environment and the fact that the up-front cost of attack submarines is high it is imperative that we make lifetime O&M costs a factor in acquisition decisions, which will surely improve the acquisition appeal of submarines.

Dr. Gansler is trying mightily to turn around the age-old Washington thought process by which no one gives much credit for the many dollars we save tomorrow (in lifetime O&M) by the manner in which we spend one dollar today (in acquisition cost). The key here is to understand Total Ownership Cost (TOC) and understand the submarine's inherent advantage. Because of Dr. Gansler's efforts, we are finally starting to make decisions in terms of TOC. We added $0.5B to LPD 17 across the FYDP to buy TOC—a true investment. CVN 77 as a transition to CVX—an evolutionary way to introduce new technologies—is a matter of TOC. And reducing TOC was an entering argument when discussions began on DD-21, the land-attack destroyer.

This framework can only work to our benefit. We've known for many years that submarines are relatively inexpensive to operate, but now we have an opportunity for this to influence acquisition decisions. Let's make sure we capitalize on this, not with philosophical discussions, but with real data. If we don't capitalize on this concept, we'll continue to be penalized by the obvious and painful fact that submarines cost a lot of money up front. The consequence of the penalty is that we might build fewer submarines.

I think my time is about up because Admiral Kauderer is reaching for the klaxon. And it would ruin my whole day and my suit if the boat submerged while I'm standing on the bridge. As I look out across the auditorium, I can tell that many of you are thinking, "What's this guy trying to tell us? We've been doing all of these things for a long time! So what's the big deal?" My response is, yes, you have been doing these things for a long time. But we don't seem to be able to tell the story well enough.

Between the continuous emphasis on platform attributes on one hand and getting caught up in fine details of technical and acquisi-

tion analysis on the other, many of us—at times, myself included—miss the point that could be made by a simple, powerful image. In some unfortunate ways, the Silent Service remains all too silent. Some public relations efforts have been flattering, but not, in my view, particularly successful. For instance, a great article appeared in the Washington Post not too long ago by a journalist who journeyed under the polar ice aboard USS HAWKBILL. He apparently had a wonderful time, because he said lots of good things about the complexity and technical marvels that are a submarine. But when I finished reading the article, I wondered how a decision-maker can find relevance in a trip under the polar ice cap that he could apply to the Kosovo crisis or to another conflict in the Gulf?

We can find some fault with our audience. They hear what they want, encouraged by Blind Man's Bluff or the works of Tom Clancy. But these authors have done exactly what the general public pays them to do. So the fault cannot be theirs for failing to make a case that is simple, accessible, and compelling.

In the past, in the heyday that we must accept is behind us, a small group of decision-makers who understood and appreciated the versatility and utility of submarines championed the cause. But today, the size of our submarine fleet indicates that the submariners' story—a very good story—just is not getting through. *That's the big deal.*

The time has arrived for me to relinquish the floor. I'd like to conclude by telling you that I am much more than an advocate of the Submarine Force. I'm also a very admiring fan of our Submarine Force. I came to this view many years ago when I first began working with submariners, understanding submarines, and learning about the remarkable things our submariners do with their boats. In fact, a highlight of my 29 years in government service was my participation last year in the DSB Task Force on the Submarine of the Future. When the Task Force was done, I felt a great sense of pride in what we accomplished, and I was certain that our work would have influence for many years to come. Let me conclude by quoting a key passage from our report: "We need more, not fewer SSNs."

Thank you very much for this opportunity to speak to the Submarine Technology Symposium, and God bless.■

## SUBMARINE MISSIONS: PREPARING THE FUTURE BATTLESPACE

*by ADM William D. Smith, USN(Ret.)*

*Introductory Remarks*
*Submarine Technology Symposium*
*May 11, 1999*

Perhaps for starters we should consider whether *Preparing the Battlespace* should itself become a submarine mission? Perhaps such a mission would better focus the R&D efforts institutionally, over the long haul, and not just for a brief but intense period during this symposium. You could argue that the Force already has this mission, but where is the formal concept, where is the articulation, and where are the written requirements?

I recently heard the VCNO, Admiral Don Pilling, paraphrase the CNO's ideas or vision about influencing future maritime events as follows. "The 21st century objective of the Navy is to interject the fleet directly and decisively ashore, anywhere, anytime." This obviously means that each platform must be capable enough to conduct a wide range of missions, and be flexible enough to cover all those contingencies that imperfect staff planning cannot foresee. The other parameter that this statement implies is that there are enough platforms to meet these requirements of "anywhere, anytime". **I don't think many of us would agree with the premise concerning numbers of platforms, at least for submarines.**

One of the more important phrases in the current lexicon of warfare across the spectrum of conflict is *area denial*. This is not quite the same as local area superiority, as in air superiority. It really means achieving a more dominant position than just described in superiority; it means denying the battlespace to the enemy ... period. Such a predominant capability necessarily means being able to operate in such a space yourself, essentially and continually, unchallenged. Translate this capability to the littoral, and imagine how many surface ships are going to be able to do *area denial* if the enemy has a technologically capable force. Such a technologically capable force would not have to be superior, but would obviously need sufficient short range high speed cruise or ballistic missiles with a remote targeting capability, creating a very, very high threat environment. I submit that not many of our

surface ships will be able to accomplish their missions for any significant duration in this environment.

Where in the world's littoral areas is this a problem? Long coasts with deep water are probably the least stressing environment, but that is not where the projected hot spots are located. The shallow and confined water of the Persian Gulf is a prime location. So is the confined coastline off North Korea where the Chinese and Russian borders and territorial waters provide unique but troublesome sanctuaries for any projected threat. Clearly current inventory missiles located along these coasts can be a real serious threat even today.

Where does this put the submarine? I am persuaded that the submarine should be the central focus of this entire problem. Make the submarine the Forward Element Command Ship, and build the area denial capability around that concept, and around the submarine. It should be obvious to the casual student of this problem that the submarine will be the most survivable platform that can remain at the scene with impunity during the period of battlespace preparation. This concept takes as a given that the submarine will be there, early in the build up or deployment, and be key even during the height of the intensity of conflict. Accepting such a concept then lets the rest of the forces coordinate their requirements for Intelligence, Surveillance, and Reconnaisance and Strike through this 24-hour-a-day, on scene capability, which has the core competency to perform this unique mission.

One of the national ISR issues that is becoming much more widely recognized is the idea that space reconnaissance systems cannot meet all the ISR requirements that will be requested by the regional CINCs. This is obvious in Bosnia and Kosovo today. This means that local and regional ISR using UAVs, UUVs, leave-behind sensors and other tactical assets will become increasingly important as these evolving platforms and sensors develop more capability and versatility.

Very soon someone is going to say, What's wrong with this picture? I would answer, today there is a lot wrong with this picture, because the submarine is not capable of performing this mission across the ISR spectrum or to do the intelligence fusion and analysis needed. However, the counter to that is precisely why we are here.

What does it take to make a submarine the Forward Element

Command Ship? Obviously it takes communications, but perhaps there are already sufficient capabilities being developed to meet those requirements. Deployed sensors; surface, subsurface, ashore, and airborne could, and should, all be terminated at the submarine, as well as improved organic and deployable sensors. Collecting this broad spectrum of information, then collating, evaluating and distributing the essential elements is the fore runner of eventual success.

To paraphrase a popular idiom, **"It's the payload stupid"** is certainly a worthwhile focus of this symposium. The Defense Science Board report on the *Future of the Submarine* certainly was strong on this point, but that does not answer the question of what the payload should consist of? What is clear, however, is that, with fewer submarines the issue of superiority and flexibility of payload becomes more important. That is also a focus of this symposium, the correct payload, and the most capability per volume of space available, within and external to the submarine.

Since the submarine is not widely recognized within the U.S. as the capital ship, or even as a capital ship, the ideas for keeping it a superior platform come first and foremost from those who believe that this platform is a critical element, and perhaps the most critical element of maritime warfighting in the littoral. This makes it difficult for new ideas to compete in the age of extensive and intensive budget shortfalls. The secret is to generate strong support for worthy ideas outside the narrow resource allocation process within the Department of the Navy, such as DARPA. Hopefully, that will also be a fallout of this symposium. Exciting new systems and capabilities often bring their own supporters.

About a year ago, during a presentation by the then Speaker of the House, he was asked how he would prioritize the defense budget, starting with a clean sheet of paper. He responded that he would put as first priority those systems where the U.S. had the clear asymmetric advantage, such as the aircraft carrier and the submarine. His approach would be to make our capabilities so far superior that a potential opponent would not even dream of trying to challenge us, or attempt to master the technology and training necessary. While such an approach is great in theory, the current peace support operations in which the U.S. is involved preclude such clear logic prevailing. That, however, should not minimize the power of the logic. We should be able to provide a number of

ideas in this symposium that will help achieve this aim with regard to the absolute and continuing superiority of the submarine.

During the Naval Submarine League Corporate Day remarks in February of this year, Admiral Skip Bowman advanced the thought that future submarine design concepts need to focus on developing electric drive, more modular construction, more payload, better connectivity and above all, be affordable. Not all of these issues will be explored in depth during this symposium, but most will be touched upon, and some in detail. These four areas are certainly a sufficient challenge to stretch all of our minds. Progress in these areas is also critical to the long term success of our Force.

We all know the oceans will not become transparent in the foreseeable future. That, however, is not the case with the surface of the oceans. Commercial satellite imagery is now available for sale on the open market with three meter resolution, and greater accuracy will soon be available. Searching the broad ocean areas is not that easy, certainly, but obtaining commercial imagery anywhere along the littorals should become fairly routine. Some of this imagery is available today on the Internet. With the ready availability of the Global Positioning Systems, or GPS, targeting battle groups with tactical ballistic missiles could become almost conventional for a technologically capable adversary. The lack of timely availability currently means that moving ships do not have any concerns, but the turn around time is decreasing and non U.S. providers of imagery are increasing and are improving rapidly.

When the full impact of this situation dawns on the world's democracies, the super stealth of our submarines will become all too obvious. The fundamental capability of this super stealthiness will dramatically increase the demand for new ideas generated by symposia such as this. The Force needs to be ready when called upon.■

# THE UNDERSEA PLATFORM FOR FUTURE MARITIME DOMINANCE

*by Bill Lillie*
*Introductory Remarks*
*Submarine Technology Symposium*
*May 11, 1999*

## The Platform Environment of 2015+

During the three days of this symposium, you'll hear a lot about the future from many perspectives. This morning you heard from our distinguished group of keynote speakers about the submarine's role in preparing and interacting in the future battlespace. To begin the day tomorrow, Dennis Bushnell, a futurist, will talk about the *Information Technology* Revolution, its impact on the future and some alternative approaches to future warfare. Later tomorrow morning, we'll take a look at future submarine payloads *(Editor's Note: see the next article in this issue.)* in Lora Weiss' session on *The Submarine as the Ultimate Asymmetric Threat*. Thursday we'll hear about *The Submarine in Netcentric Warfare* in Brian Sharkey's session. Later that day Admiral Studeman will paint the picture of *Threats of the Next Century*. These will all affect the submarine platform.

Even before this year's Submarine Technology Symposium began, you've heard views of the future and discussion of needs from the Defense Science Board report of last summer. This past fall DARPA and the Navy signed a Memorandum of Agreement entitled *A Project to Revise Payloads and Sensors of Attack Submarines*. Several months later, DARPA solicited industry ideas "to determine how payloads, related sensor technologies and the supporting platform design of U.S. submarines should be reconstituted ... to maximize their effectiveness through the 2020 timeframe ...". As you are aware, several teams are now funded to develop their ideas over the next 18 months. All of these ideas for improved submarine presence in the battlespace affect the platform.

Across these myriad opinions, options and opportunities for the future, there is a common thread, the submarine. The submarine is the enabler. The submarine is the means by which payload, sensors and their delivery systems (e.g., missiles, UUVs, ASDS) are delivered covertly to and sustained in the theater of operations.

The submarine, the Defense Science Board concluded, is "a key and enduring element of the future naval force—*a crown jewel* in America's arsenal". Our focus for the next several hours is the submarine, **The Undersea Platform for Future Maritime Dominance.**

Do we profess to know what that future platform should be? No, although you'll hear some ideas. We do see some glimmers of where to go, in part, based on where we've been.

## The Historical View

Forty years ago we were designing and building submarines at a rapid pace. We designed and built new ships for new missions or made changes in existing designs to improve on the way we performed the same mission. More recently, the SSN 688 Class illustrates both of these points. As technology became available, the class was continually improved to perform it's mission, and the design change to add Tomahawk enabled an entirely new mission capability.

Our history also says that the platforms require design commitments early in the design cycle and that only minor changes can easily be accommodated in their 30-40 year life. While the Virginia class is the first class to challenge that view with its modular design that is ready to accommodate technology insertion, many earlier examples point to the difficulty of platform modification to support emerging missions and technologies. Consider the USS GEORGE WASHINGTON, USS PARCHE, USS KAMAHAMAHA and the addition of VLS to the SSN 688 class, all had significant platform changes driven by the need for new missions that were unanticipated at the time of initial design. All of these modifications required a significant effort and had to be done during a major shipyard availability.

History, therefore, gives us this lesson—our platforms must be flexible, not only in design and construction and ability to infuse evolving technologies (as Virginia Class), but flexible in their payload. Payload flexibility allows the ship to perform in a variety of missions at any time, i.e., mission flexibility. In essence, we need to change the way we look at the platform, not as a product, but as the service it performs. We also must recognize that we are in a period where we are not designing many new submarines;

consequently, flexibility must be included in those that we do design. Our design view must shift from the *platform centric design* to a *mission centric design;* not just for our present missions but for our future missions as well. We also must take from history the lesson, that no matter how well we think we've envisioned the missions of tomorrow, we will be imprecise. For tomorrow, we must be able, quickly and affordably, to adapt for both known and unknown missions, years before the missions occur. We need to be *conceptually adaptable* today for the missions of tomorrow. As we all know, anything that does not or cannot adapt becomes extinct.

Just how do we do this?

## The Path to Platform Adaptability and Flexibility

First, we must be prepared to expand beyond our traditional *platform paradigm* of a conventional single hull with cylindrical sections. There is a growing belief that a double hull is the correct approach for the future. An obvious, key aspect of a double hull approach is the ability to make use of the space between the hulls and the additional hull surface area. Double hulls enable greater flexibility in the design of the inner pressure hull and the hydrodynamic outer envelope. The pressure hull can be optimized for structural, structural-acoustic and arrangement considerations while the exterior hull is optimized for hydrodynamic and stealth requirements. Locating the main ballast tanks along the hull, between the annulus, shortens the ship and moves it closer to the optimum hydrodynamic length/diameter ratio.

Central in the approach for mission adaptability lies in *driving* platform flexibility from the outside with an *outside-in* design philosophy while optimizing the interior volume design. The *outside-in* approach for payloads, sensors, stealth and other design features, allows a consistent interior volume for a variety of mission approaches, thereby gaining the maximum in platform affordability. A guiding principle of this approach is to minimize the ship impact of internal upgrades while incorporating system level upgrades (sensors and payloads) externally where ship impact would be minimized.

Internal improvements have come a long way. Virginia class has design and construction flexibility and forward-fit technology

insertion flexibility. We need to continue to make the inner volume *technology insertion* friendly. Beyond common interior volumes for a number of submarines, commonality of interior systems and components across multiple Navy platforms and programs also leads to Navy-wide affordability.

*Outside-In* design for external weapons and sensors relies heavily on a *plug and play* approach, like that so successfully demonstrated in the Virginia class Structurally Integrated Enclosures for onboard electronics. The concept of *universal* weapons modules and sensor packages with common platform interfaces (i.e., plugs) will greatly enhance flexibility.

As we have created new designs in the past, we have been very well served by staunch, thorough attention to the lessons from the past. With the necessity to assess and indeed implement more drastic design changes in a force of fewer ships, it is even more imperative that we build on the past lessons and retain sound design assessments.

Our platforms need to be flexible in theater, adapting to changing mission and situations. We also must move into a *platform of platforms*, mother-ships with adjuvant vehicles and progressively smaller emerging *platforms*. Our platform adaptability can foster mission flexibility and affordability by allowing our least expensive *platforms* to be used in the highest risk areas.

While the conclusions are some months away, a likely outcome of the ongoing DARPA/Navy Payload and Sensors program, will be a strong emphasis on adaptability and flexibility of the platform.

Technology today supports extending the modular flexibility of ship design into the life cycle of the ship. At the August 31, 1998 meeting of the Submarine Technology Oversight Council held at Electric Boat, Electric Boat presented how new technology will be able to support *Life Cycle Modularity* in the future, resulting in a *Plug 'n Play* compatibility for major sections and modules of future submarines.

Admiral Bowman amplified that theme in his recent article *Submarines in the New World Order* that appears in the Spring 1999 issue of Undersea Warfare. I quote from the Admiral's article:

> "Modular construction is the most cost-effective and operationally supportable means of providing for technology

insertion into our new submarines. Significant modularity is already embodied in the design and construction of the new Virginia (SSN-774) class attack submarine. This design will facilitate planned technology insertion over the life of the class. In designing follow-on submarines, these modular concepts will be carried to their logical conclusion, to yield maximum flexibility in operation, economy in procurement and construction, and improvement in our modernization rate.

"With modular construction, we will also be able to deploy significant payload variations in our submarines using a single basic design. The modular architectural approach implements a basic, standardized structural *shell* that contains the nuclear propulsion plant and ship control functions, along with fundamental self-defense capabilities. Variable payloads can then be configured as *plug-and-fight* modules that would mate with the basic hull form, using standardized electrical and mechanical interfaces. These SSNs with optimized special payloads must preserve the submarine's core advantages of stealth, mobility, and endurance and retain their important multi-mission capability. But the added flexibility to substantially enhance a chosen mission area—or set of mission areas—would offer a significant advantage over what I've called our traditional *Noah's Ark* submarine design concept, in which *small numbers of everything* are carried aboard each submarine all the time, potentially to accomplish any conceivable submarine mission.

"A truly modular design would permit unprecedented flexibility for operational commanders to tailor their fleets."■

# FUTURE [2020-2030] *STRATEGIC TECHNOLOGY ISSUES*
## A Presentation at the Submarine Technology Symposium
## May 12, 1999

*by Dennis M. Bushnell*
*Chief Scientist*
*NASA Langley Research Center*

### Technological Developments

Mankind is currently entering a third major Technological Revolution, equivalent in impact to the previous Agricultural and Industrial Revolutions. This Revolution involves IT (Information Technology) and includes tremendous advances in communications, computing, sensors and electronics. This technology enables, increasingly, *automatics* and Robotics-in-the-large and pervasive 3-D immersive multi-sensory communications, as well as ubiquitous miniaturized multi-spectral sensors. There are major improvements in the offing compared to the current state-of-the-art including bio, optical, quantum and carbon nanotube computing and the bandwidth/speed to do virtual reality well. Farther term but synergistic to this is a potential Nano Revolution, the first manifestation of which is carbon nanotube technology, offering a factor of 600 increase in strength-to-weight compared to steel, the conductivity of copper and a ten-to-the-fourth reduction in computing electrical power requirement.

The importance of IT is manifest in the level of U.S. private industrial research investment in the areas of telecom, computers, electronics, software and semiconductors—on the order of 100 billion dollars per year. The emerging impacts of this IT Revolution upon human society are tremendous and wide-ranging. At home tele-commuting now involves some 18 million Americans, with this number expected to climb to the order of 50 million in some 15 to 20 years. Tele-shopping from home is also a growth industry, 32 million Americans utilized the web for their Christmas shopping last year. Tele-entertainment is becoming increasingly multi-sensory and immersive, and the same technology is promoting *tele-travel*. At-home tele-education which is asynchronous, web based and constructed on the basis of motivational/learner precepts could pre-empt conventional education at huge savings to society. Tele-commerce is even today increasingly endemic across

the board and the field of tele-medicine is in a phase of rapid development. Tele-politics has been increasing since the '60s.

The electronic/IT frontiers are altering, in real time; distance/ boundaries, time, memory, economics/employment, medicine, shopping, societal/human interactions, education, governance, entertainment, commerce and travel. The IT revolution is expected to cause employment shifts into software [creation/-maintenance/security/safety/etc.] intelligent systems/agents, the design end of designer materials/life forms etc., quality of life enhancements and the virtual exploration/simulation/understanding and control of natural and artificial systems and systems of systems from subatomic to galactic scales.

The economic position of the U.S. vis-a-vis the *Rest Of the World* has eroded since the '50s when the U.S. produced over 40 percent of the world's GDP and conducted over two-thirds of the planet's research. Today the U.S. contribution is on the order of 20 percent of GDP and between one-fourth and one-third of the research. This erosion is expected to continue into the IT Revolution due to the nature of Information Econometrics. The emerging age of tele-everything and ubiquitous [satellite] communications no longer requires many of the tremendous capitol investments of the obsolescent Industrial Age, most notably in the educational arena. Therefore, nations can literally *leapfrog* the Industrial Age development process and move directly to Infomatics. In the 2025 time frame several entities will have economies of the same order as the U.S. [e.g. the European Union and China and perhaps even India] and IT technology will be even more endemic worldwide.

The major influences of the IT Revolution upon future warfare include ubiquitous/miniaturized/networked multi-spectral sensors, robotics/ automatics, inexpensive long-range precision strike, information/net warfare and micro-to-nano satellites. The concurrent bio-Revolution will provide inexpensive bio weaponry of a particular insidious variety—binary weaponry the parts of which are broadcast separately and therefore only detectable when combined within the body. The purpose of the present paper is to indicate how these emerging technologies influence warfare at the strategic level (then year) and to posit some potentially war-winning and affordable approaches to Future Warfare (aka projections).

Nature of *Future Warfare*

Most of the numerous studies of future warfare tend to agree on the following set of assumptions:

1] Proliferation [via a combination of civilian and military activities] of tactical ballistic and cruise missiles, IT, precision strike/targeting, multi-spectral sensors, space reconnaissance, camouflage/spoofing technology, robotics and bio/chem munitions.
2] Information, economic and sensor-anti-sensor warfare are major issues.
3] Targets defined by distributed/robotic multi-spectral sensors.
4] The *Killing Ground* is exceedingly deadly, potential demise of *visual range combat*.
5] Beam weapons are increasingly prevalent, speed is no longer equated to survivability.
6] Logistics assets are highly vulnerable in or out of theater.
7] In and near theater ports and airfields are too vulnerable/unusable.

This set of assumptions, if largely correct [which is a high probability] drastically changes warfare across the board compared to today's conventional wisdom and inventory. As an example, long range, precision strike, low observable, radiation hardened cruise missiles are expected to be exceedingly affordable to the point where the U.S. could be faced with *clouds* of these during a forced entry. Cruise missiles are already in the inventory of some 73 countries and have a range and payload similar to a TBM at a fraction of the cost, with a potential *witches brew* of warheads [CBN, info, smart mines, non-lethals/non-functionals etc.]. Also, civilian space budgets, worldwide, are expected to be in the $170B/yr range by 2008, making space access and platforms readily available. Civilian overhead remote sensing systems will be capable, in three to four years of less than one meter resolution with a one day repeat, a 110 Km swath and multi-spectral information. In addition, there is a major worldwide scientific effort to track *global change* via sufficient overhead and other sensors to establish a *digital earth* data base. This effort has an increasingly impressive collection of assets with rapidly improving resolution.

This *scientific* data is made available to the International public on a series of web sites.

Therefore the ability to wage **very capable** warfare will be widely available and relatively inexpensive [which contributes to the ubiquity of the capabilities]. Then-year Warfare *On The Cheap* includes info/net warfare, bio weaponry including the binary option mentioned previously, non-lethals, miniature smart mines, small UAV's, and inexpensive cruise missiles, giving rise to a large number of potential **peer competitors** [in the context of *then-year* warfare and destructive/kill capability] as opposed to today's peer competitor concept involving large tonnage of Industrial-era hardware. A Defense Science Board study concluded that the *Enemy After Next* could have offensive info warfare capabilities, CBN [the N could be simply *dirty* radiation munitions], RSTA, AIP submarines with advanced torps, precision strike, underground facilities, camo/concealment/deception, and large numbers of inexpensive cruise missiles. An OSD/Office of Net Assessment study [Future Warfare 20xx-V 3] suggests that potential adversaries could have area denial capabilities out to 1000Km from shore, and an offensive capability that could reach to our points of embarkation. A very fundamental issue/difficulty is a potential inability survivably to transport in-theater sufficient weaponry to protect surface and air assets from the large number of inexpensive and **very capable** weapons available to a then-year adversary, e.g. a country-sized magazine. We simply run out of *bullets* first. Beam weapons for self defense may turn this around and make surface assets viable, but this hinges upon the extent to which cruise and other incoming can be *rad-hardened*/beam hardened.

A **significant** additional complication is the then-year target set for future warfare. Projections indicate about 70 percent of the world's population [and associated infrastructure/wealth] will collect in urban areas/urban canyons. Target characteristics for *MOUT* [military operations in urban terrain] include relocate[ing], buried, highly distributed, well defended and, in general, really tough to identify. This situation is further obfuscated by the simultaneous presence of an endemic civilian population. The classical MOUT experience is on the order of 70 percent casualties, largely mollifying conventional warfare approaches to MOUT in the *CNN* age.

These urban areas are usually, for historical/trade reasons, on

or near littoral waters and therefore submerged assets are obvious candidates for at least a can-opener role for then-year forced entry. Here again, the ubiquitous multi-spectral sensors suites pose a problem. Submarines in shallow water have a large number of potentially exploitable signatures, e.g. visual, bio-lum., lidar off the hull, IR, turbidity, passage pressure perturbations upon the water column chemistry, salinity scars, chemical releases, internal and surface *waves*/surface surfactant layer modifications, in-situ turbulence/wakes, magnetics, coms, periscope, etc. All in addition to low frequency active multi-static sonar. Although each sensor would have a large false alarm rate, when operated collectively on a *take-a-vote* principle a large detection probability exists, large enough that submerged platforms should probably stay offshore in deep[er] water and send in various flavors of UUVs.

Asymmetric Warfare is another issue which is agreed upon to the extent that we need to worry about it but not yet agreed as to its nature/ manifestations. At the zeroth order the U.S. has a very long, essentially undefendable coastline [unless we totally reconfigure our military in the sense of real *homeland defense*], some 80 percent of our population and assets are located 50 miles or less from a sea coast. We also have an increasingly vulnerable logistics chain [in and out of theater], a tremendous sensitivity to the *CNN syndrome*, are essentially open to the entire spectrum of terrorism and place increasing reliance upon overhead systems which are increasingly vulnerable [as are Kennedy, Vandenberg and Wallops, which are located right on the seacoast[s]]. Inshore SS and offshore (*civilian*) surface ships could deliver a very nasty wakeup call to the U.S. CONUS has not been seriously threatened since the war of 1812. The U.S. is an Island Nation, the surrounding Oceans have long been our defense bulwark and our Department of Defense has evolved into a *Department of Offence* with inadequate consideration, at least thus far, to then-year in-shore threats to CONUS.

## Some Alternative Approaches to *Future Warfare*

*MOUT* The conventional approach to MOUT is to bomb, bombard/ blow up the area [rearrange rocks] and follow this up with a manned invasion/attack during which we bleed/take a high number of casualties. An alternative *back to the future* approach is

to utilize advanced broad-spectrum precision strike and *volumetric* weaponry to lay siege to/quarantine the area and cut off water, food, electrons, photons, reinforcements and medicine. This could be carried out by a combination of **very survivable** and relatively inexpensive [but *different*] systems. The first of these is a 60 to 100 foot long barrel [actually a battery of these] situated in CONUS with refurbishable bands of sequentially detonated explosives distributed along the barrel, with the barrel initially evacuated. Such a device [where the explosive bands focus to exert maximum pressure on the back center region of the projectile and not on the barrel itself] can, for about $50/Lb of projectile, accelerate a 1 K Lb. projectile to Mach 20 to 25. Such a projectile could provide, via off-board coms with GPS backup, GLOBAL PRECISION STRIKE - relatively inexpensively and without tanking B-2s or steaming [increasingly vulnerable] carriers. The flight path is hypersonic boost-glide, not ballistic, with terminal phase maneuverability. This class of weapon has excellent launch stealth, affordability, flexibility, ferocity, reaction time, survivability and *recallability*. Also it is far superior on all counts [cost, capability etc.] to light gas guns, railguns or ram accelerators.

Another major system useful in such a siege approach [or other power projection/forced entry situations] is a submersible which lurks in deep[er] water and deploys autonomous/tele-operated systems/vehicles in-shore, e.g. *lays eggs*. These in-shore adjuncts would uniquely provide especially short time-of-flight for time-critical targets. The submerged platform suggested is fundamentally spherically shaped with a fully integrated propulsion system to provide both flow separation control and improved propulsion efficiency. This approach synergistically combines a nearly optimum hydrodynamic overall configuration with excellent volumetric efficiency [large loadout/number of deployed weapons] and structural efficiency for the pressure loading at depth.

The warhead options for this weaponry includes, then-year [along with the usual HE] Electro-Magnetic Pulse (EMP), Infowar [anti-sensors/coms/operability/ commerce], miniaturized smart mines, fuel-air and dust explosives, RF, chem/bio anti-functionals, acoustics and a Micro Electro-Mechanical Systems (MEMS) mechanical analog to chem/bio which could burrow into the body. Most of this can be termed *volumetric* weaponry/munitions in the sense of influencing a sizable volume of space as opposed to the

usual *point impact* explosives. Such munitions are essential for MOUT due to the innate characteristics of the terrain and the target set. Another, wholly different type of system for MOUT is Autonomous Urban Flying Ordnance. These are mini lethal UAVs with electrical propulsion [via energy storage in the structure], armed with flachettes with nano-tube armor/structure and equipped with sensors to discriminate the odors given off by Warriors versus frightened citizenry for target discrimination.These flying weapons could have a cooperative engagement conops [among themselves] and be capable of blowing doorways/windows and moving with facility in the innately 3-D MOUT environment.

Volumetric Munitions Many of the following are already being pursued and were mentioned briefly in the previous section. Some are included under the rubric of non-lethals or *Dial-a-Pain*. The fundamental requirement is to develop work-arounds to the innate limitations of conventional HE warheads—effects are essentially localized and therefore a large number are required with the attendant logistic and affordability/operational downsides. Precision strike technology has helped this for open country warfare but MOUT /other difficult terrain still presents problems in this regard. NBC munitions are obviously volumetric in effect/exceedingly efficient but are *off the table*, at least for most U.S. operations [unless allowed by the NCA].

There are some munitions in the inventory which have volumetric influences and others are under consideration/development. These include fuel-air explosives [in inventory] and the related dust-air approach. Beam weapons are also volumetric in effect in the space-time continuum and due to their speed/slewing capability. Those being worked/considered include info-war munitions [anti-sensors/comms/operability/commerce etc. including EMP], and chem/bio *anti-functionals* which attack equipment as opposed to humans. Another whole set is based upon targeting the innate resonances [to reduce required power levels] of the human body from a structural-mechanical or electro-chemical point of view. These include acoustic weaponry at the frequencies of the human chest cavity and the colon. The requisite acoustic power [greater than 150 db] is [recently] readily available from open cycle pulse detonation wave engines, which could be used to propel the munition and the device/effect is aimable. Another *resonance* is use of RF weaponry at brain wave frequencies as opposed to simple

heating.

Another whole class of volumetric weaponry is miniature *smart mines*. These are based upon the Sandia *chemical analysis on a chip* technology. Micro multi-spectral sensors are implanted on a miniature device along with a flechette which is aimed by a MEMS device. These are camouflaged and distributed throughout the battle space and networked. The multiple physics nature of the sensor suite, combined with a *take-a-vote* approach precludes spoofing and provides detailed intel regarding the battlespace and capability to take-out/target what appears to be hostile.

Breakthrough Technologies Several technologies currently on the horizon have the potential to significantly change things. These include a recent observation that composites could be configured as *ultra-capacitors*. That is, electrical energy could be stored in the platform/weapon STRUCTURE [non-chemical battery]. Depending upon how much energy etc. this could have a tremendous impact upon LO, range, affordability etc. of much of future weaponry. As examples, tank armor could be used to store energy for multiple EM gun shots and advanced solar panels could, combined with structural storage, completely change much of the *fuel independence* problem. Energy storage is also a major issue with autonomous systems. For submarine AIP a related breakthrough is C-nanotubes. Energy storage is again a possibility. In addition, the c-nanotubes have about 600 times the strength-to-weight of steel and the conductivity of copper. Obviously excellent candidates for simultaneous Armor and LO functionality. Applied to computing, C-nanotubes potentially offer a ten-to-the-fourth reduction in power requirement and petaflop speeds. The applications to just about every system for various metrics are obvious.

## Concluding Remarks

Warfare into the 2,000's [2025+] should prove quite different, Info/net warfare and volumetric weaponry as opposed to the current *HE on the pointy end*. Much of this will be "warfare on the cheap" and therefore the number of *peer competitors* who will be capable of inflicting significant damage to the U.S. (or anyone else) could be quite large. Also, the emerging chem/bio threats, particularly of the *binary* variety and their excellent affordability, along with potential micro-mechanical analogs, and the *CNN*

*Syndrome* is making *Robotic Warfare* look better and better. All the services, especially the Army, are actively studying *unattended* munitions/sensors and platforms for logistics, spoofing, RSTA and active defensive and offensive operations. **To a major extent, our current legacy platforms(which we are still building/plan to build variants of) will be, then-year, TARGETS.■**

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REUNIONS

**USS ABRAHAM LINCOLN (SSBN 602)** October 8-10, 1999 in Groton, CT. Contact: W.T. "Doc" McCance, 16 Chapman Lane, Gales Ferry, CT 06335. Phone: (860) 464-6758; e-mail: doc602@downcity.net.

**USS DIABLO (SS 479)** November 3, 1999 in St. Marys, GA. Contact: Norbert Ayers, 900-G Executive Lame, Kennesaw, GA 30144-4525. Phone: (770) 794-8740).

**USS JACK (SS 259/SSN 605)** October 15-17, 1999 in New London, CT. Contact: Richard Moore, 9177 Davenport Road, Gloucester, VA 23061. Phone: (804) 693-5284; e-mail: rmoore@inna.net.

**USS PICUDA (SS 382)** October 10-12, 1999 in New London, CT. Contact: Mike Wingeier, 1646 Akins Road, Atoka, TN 38004. Phone: (901) 837-8610; e-mail: sankberni@aol.com

**USS TECUMSEH (SSBN 628)** September 22-26, 1999 in Reno, NV. Contact: John J. Flynn, 9460 N. Spruce Road, River Hills, WI 53217. Phone: (414) 228-8345; e-mail: johnflynn1@ft.newyorklife.com.

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# THE SUBMARINE AS THE ULTIMATE ASYMMETRIC THREAT

*by Dr. Lora G. Weiss*
*Introductory Remarks*
*Submarine Technology Symposium*
*May 12, 1999*

The papers in this session explore the weapon and combat systems that give the fighting power to the submarine platform in missions at sea, in the littorals, and in support of the land battle. The concepts presented will describe how new technologies can enable a comparatively small ship with a relatively small crew to have a disproportionate impact on deterrence and conflict.

With the rapid changes that the Navy and the military are undergoing, we can begin to envision a new era of warfighting that is unrecognizable by today's standards. Much of today's military structure likely will be gone: large forces will be eliminated, manned vehicles will be replaced by unmanned drones and stealthy ships, small mobile units will be ever present in the battle and will be moving data and information around as never before. It is expected we will be able to assault enemy targets halfway around the world, striking with pinpoint accuracy that we never thought possible. All of this allows us the opportunity to look ahead at the technical possibilities of how the war can be fought at longer standoff ranges and with fewer lives lost.

These ideas propel us into conceptualizing what the new payloads and weapons will be and how they will be delivered. We will make all attempts to engage a threat at maximum distance to provide the greatest time for self-protection. For the unexpected close-in encounters, we also need quick reaction undersea and airborne weapon systems. High speed torpedoes, going over 150 knots, will generate new paradigms for fighting the close encounter ASW scenarios. These torpedoes will also be fully capable of engagements at tactical ranges. We envision seeing mini submarines capable of speeds up to 100 knots that can carry an assortment of external torpedoes and underwater rockets. We are developing technologies for submarines to deliver small manned or unmanned vehicles with significant ranges and increased payloads.

These potential submarine delivered vehicles are expected to have un-refueled ranges approaching those of today's non-nuclear submarines, and we are now developing the capability to execute a wide range of missions using forward deployed submarines that can still maintain long standoff ranges, on the order of thousands of nautical miles.

With all of these tremendous advances in improved weapons and payloads, digitized warfare, and miniaturized electronics, caution must be exercised while this cutting-edge technology is developed commercially since this revolution in military advances will be freely available to other countries and terrorists. A rogue state or hostile regional power may exploit these 21st century technologies before we do and in ways we have not anticipated, and they could inflict terrible damage on an unprepared U.S. Our future engagements will be against more capable and more sophisticated threats.

In addition to these threats, our current environment promotes the tendency to work on urgent and immediate needs, not the important and futuristic concepts. This shortsighted approach could have a deleterious effect on future conflicts and engagements.

We must anticipate warfighting scenarios that others have not considered. There are so many technical success stories that these successes often mask the underlying limitations and capabilities of our payloads and delivery systems. We must not be content with what we have, and instead, we must continuously advance our payloads, weapons, and weapons delivery systems.

Both the military and commercial sectors have made and will continue to make significant increases in the developments of technologies that are driving the computer, sensor, chemical, and propulsion sectors. These advances are exciting and will lead to changes in warfare more sweeping than at any other time in history. They will enable us to consider a dramatically different military, one no longer dominated by aircraft carriers, large forces, and manned vehicles.

The papers in this session are aimed at providing a glimpse of some of the potential technologies that our Navy can expect to have available. Concepts such as a new technology engine that can be designed to operate underwater, waterborne, in air, and on land, so that it is applicable to multiple platforms operating in multiple environments will be discussed. You will hear about concepts such as very high speed supercavitating torpedoes and Mach 15 intercept

missiles that will allow us to attack before the enemy has a chance to blink. There are technologies that promise to revolutionize future designs of propulsion systems in the areas of speed and endurance, and will therefore expand our naval air and underwater vehicle missions. Such concepts address the attack objectives of increasing the probability of kill and decreasing the probability of counter kill by minimizing counterfire, evasion, and countermeasure deployment and therefore minimizing threat reaction time. In all of this, you will hear about the tradeoffs of speed versus stealth. By using high speed or stealthy weapons or delivery vehicles, we can increase our weapon effectiveness.

Over 80 abstracts were submitted to the entire symposium. Of those, over 50 were applicable and considered for the seven to be presented in this session. This shows the great interest, enthusiasm, and vitality in the area of submarine payloads and deployed devices, and it identifies how important the offensive and defensive capabilities of the submarine are.

The technologies you will hear about today begin in the undersea environment with high speed supercavitating torpedoes and long range ultra stealth torpedoes. We then move to a talk on power systems for submarine delivered vehicles that will potentially increase the range and speed of these systems. From there, we hear about a vehicle that can operate both undersea and in air. We then move from undersea to airborne weapons with a talk on Uninhabited Combat Air Vehicles, or UCAVs, and we finish with a talk on a new incarceration of directed energy weapons. So please, sit back and enjoy a brief look into the future of the submarine as the ultimate asymmetric threat.■

# THE SUBMARINE IN NETCENTRIC WARFARE

*by J.B. Sharkey*

*Introductory Remarks*
*Submarine Technology Symposium*
*May 12, 1999*

Almost every weekday morning, the three things I do before leaving the house is 1) download the prior evenings e-mail, 2) strap on my pager and, 3) check the battery level in my portable cellular telephone. Each day, and with very little effort, I become part of the network centric ethos of the modern workforce. It is, as Admiral Cebrowski noted, the second major sociological trend that has been radically influenced by communication technology when he said that; "networking, utilizing the Internet, intranets and extranets, is rapidly becoming a principal organizing force in the world."[1]

This network centric lifestyle has become so common to me that I was amused to reflect on the fact that only about half a generation has passed since the emergence of this capability to personally connect anywhere and at anytime—fixed or mobile. Consider the fact that the first communication satellite experiments, Score and Courier occurred only 41 years ago in 1958 and 1960, the first successful passive communications test occurred with Echo in 1960, and the worlds first commercial satellite capability, INTELSAT1 was launched in 1965—only 34 years ago. The first UHF service to the U.S. naval fleet, MARISAT, will celebrate its 23rd birthday this year.[2] Direct Broadcast, Digital PCS, Internet and Multi-mode Internetworks have all been commercially introduced only within the last 15-20 years.

One gets the sense that we have moved very fast in realizing a truly global Network Centric environment. But, if the current trends continue, we will realize that we are only just beginning to push off the starting blocks. According to the Harvard Business School, "In the next decade, some 1,700 satellites will be launched into space, creating the potential for more than 3 billion people to view CNN, make a phone call, tap into the information superhighway, or watch reruns of Seinfeld and the X-Files. Assimilation will be swift. Our modern communications system is the result of more than a half a century of planting copper wires in the ground, over our heads, and in our walls. The 21st century's infrastructure of satellites, ground stations, and wireless networks

is being put in place in a fraction of that time."[3] John Patrick, Vice President of Internet Technology at IBM predicts; "we are on the verge of a global area network with billions of users. Our cars, appliances, pagers, and homes will transmit information from their own Internet addresses. Your car is going to send you an e-mail message telling you it is time to change the oil."[4]

Connectivity is one dimension of capability when describing the Network Centric infrastructure. Bandwidth, the ability to convey information, or data bits, is another. For that metric, the future also appears to be unlimited. As Andy Grove, the CEO of Intel, observed; "you think computer prices are plummeting while capacity increases. Wait until you see what happens to bandwidth".[5] The following table presents that point. Moore's Law argues that processor power, roughly measured as the number of transistors or gates on a single chip, doubles every 18 months. As can be seen in this table, backbone and available user bandwidth are expected to increase by an order of magnitude every 24 months.[6]

**Table 1. Explosive Growth in Available Bandwidth**

| Year | Backbone | Home Users | Equivalent (if Moores Law) |
|---|---|---|---|
| 1996 | 45-155 Mbps | 28.8 kbps | 28.8 kbps |
| 1998 | 500 Mbps | 288 kpbs | 48.0 kbps |
| 2000 | 5 Gbps | 2.88 Mbps | 76.8 kbps |
| 2002 | 50 Gbps | 28.8 Mbps | 115.2 kbps |
| 2004 | 500 Gbps | 288 Mbps | 192.0 kbps |
| 2006 | 5 Tbps | 2.88 Gbps | 307.2 kbps |

Reference: "Hologram of Atoms", Forbes ASAP, June 1996.

The realization of this future Net Centric capacity was noted by a CNO tasked, and National Research Council (NRC) sponsored Panel on Information in Warfare completed in 1997. The panel, whose charter was to review current and emerging information technologies relating to the U.S. Navy and Marine Corp missions concluded; "information distribution and command and control in

the 2035 time frame will provide a completely transparent and seamless medium for transfer of information to users". The panel envisioned that in 2035, **problems associated with the availability of connectivity, capacity and coverage would be largely solved.** Further, commercial network infrastructure will provide connectivity to the naval forces, and access will be obtained through lease or outsource arrangement.

Let me highlight what I just stated: **connectivity, capacity and coverage will exist, Fixed and Mobile, but with a reliance on commercial network infrastructure.**

Internetworking is so commonly practiced in the commercial world that we sometimes forget that the Navy is not fully Internetworked in its tactical infrastructure. For example, a specialized converter translates between Link 11 and Link 16 formats, but there is no way to address an arbitrary packet from outside the network to a member.[7] As the U.S. Navy prepares itself to become a Network Centric fighting force of the 21st century, it is faced with a very modern dilemma: whether, how and when to invest in the development of network technologies? The service cannot compete with the pace of the information revolution taking place in the commercial sector and thus must learn to exploit, purchase or lease, these capabilities. At the same time the Navy and the U.S. government in general, cannot afford to allow the reliance on this commercial infrastructure to create vulnerabilities that might lead to an incapacitated war-fighting machine.

In this afternoon's session, we will focus on the roles, missions and technology requirements for one of the Navy's principal weapons platforms, the submarine, as it prepares to participate in this Network Centric environment of the future. The session is broadly divided along two major themes; 1) How will the submarines missions and Command and Control doctrine change as a result of access to mobile broadband networked communications infrastructure, and 2) What are some of the technology challenges and approaches for exploiting this capability specific to submarines in the 21st century?

We start this session with an invited keynote paper presented by Rear Admiral William Holland who will address the history of submarine command and control and how C2 will be affected by communications and information technology in the future.

Carl Siel, of the Submarine Communications Office, PMW 173, will then present an overview of the current submarine communica-

tions programs and requirements to support Network Centric Warfare addressing the challenges of providing enhanced connectivity while maintaining stealth and affordability.

Then we will hear two papers on the changing roles and mission of the submarine force. First, Captain Jim Patton will present emerging missions of submarines against a backdrop of the history of submarine communications. This will be followed by a presentation by Ed Anderson on a concept for submarine launched and controlled UAVs to support Intelligence, Reconnaissance, Surveillance and Targeting roles.

The final segment of the day will focus on technologies that can provide ubiquitous connectivity with increased bandwidth needed to support these future missions. We will hear two papers related to future concepts for providing high bandwidth antenna designs; the Large Aperture Mast Antenna, presented by Bill Craig of the Naval Undersea Warfare Center, Newport; and, the so-called DARPA and NRL "bake-off for the Buoyant Cable Antenna Array" presented by Gary Somers and George Thompson of MIT and APL.

Finally, Captain John Policari of DARPA will provide a presentation of current DARPA work related to future submarine payloads.

With that brief summary, it gives me great pleasure to introduce out first speaker, Rear Admiral William Holland.■

ENDNOTES

1-VADM A. K Cebrowski: Sea, Space, Cyberspace: Borderless Domains, Feb 1999

2- "Technology for the US Navy and Marine Corp, 2000-2035, Volume 3 Information Warfare, National Academy Press, National Academy of Sciences, 1997

3- Regis McKenna; "Real Time", Harvard Business School Press, 1997, p27

4- John Patrick (VP- Internet Tech, IBM), "Internet World", Newsbytes News Network article, March 1997

5- Andy Grove; Intel CEO, "Life after Television", Forbes ASAP, Feb 1994

6- Jack Rickard; "Bandwidth Arithmetic and Mythology", Boardwatch Magazine, May 1996.

## KEEPING THE SUB FORCE LEVELS AFLOAT

*by Ernest Blazar*

*Ernest Blazar is a Senior Fellow at Lexington Institute, a public-policy, non-profit think tank in Arlington, VA.*

The end of the Cold War was supposed to usher in a period of *strategic pause*. That assumption lay behind the reason for the significant cuts in U.S. military force structure since 1989. Without a rival superpower, the U.S. military could handle two nearly simultaneous, regional wars and could easily meet normal peacetime requirements, the thinking went in the early 1990s.

Fast forward nearly a decade in an examination of one part of the U.S. military.

The Los Angeles class attack submarine, USS BOISE, was yanked out of a U.S. Atlantic Command-sponsored joint exercise with the British and Norwegians in 1998 and sent to the Mediterranean to cover for a possible Tomahawk missile strike, a tasking sent out by U.S. European Command.

Later, USS PITTSBURGH was pulled from "Battle Griffin" a major NATO exercise in the North Atlantic to respond to an urgent need for submarine coverage in the U.S. Central Command.

So busy is the Submarine Force—58 strong as of this writing, but headed for 50 in coming years—that it is able to provide only the bare minimum submarine support for the Joint Interagency Task Force's anti-drug campaign despite the fact that submarines have been rated as the most effective platform for the detection of *go-fast* drug running boats.

Nor is the Submarine Force able to provide the four attack subs that U.S. European Command says it continuously requires in the Mediterranean. Nor can it supply that command with a year-round availability of a submarine with a dry-deck shelter for special operations missions.

Strategic missile submarines, the *boomers*, have been pressed into service as *opposition forces* during ASW training, something they have rarely done before, all in an effort to provide some relief to overworked attack submarines.

These are all examples of how optimistic assumptions about the post Cold War period have run false and what effect it is having on

at least one community within the U.S. military. And it raises the issue of whether the cuts in the submarine force structure, predicated on those false assumptions, should be revisited.

During the late 1980s, the size of the U.S. attack Submarine Force peaked at 98 boats. By 1997, the fleet had shrunk below 72 hulls, the minimum number able to meet all the operational needs of the regional CINCs. At that time, the 72 strong force was able to support a constant, overseas deployed presence of about 16 boats.

Today's fleet of 58 attack submarines can support about 12 forward deployed. When the Submarine Force reaches 50 in coming years, only about 10 of those boats will be forward deployed at any one time.

"While each of your individual submarines with its highly capable crew can be a marvel of technology, at some point quantity becomes its own quality," Vice Admiral Ed Giambastiani advised Congress on April 13. He is the Commander of U.S. Submarine Forces in the Atlantic. He warned that even though the Submarine Force has already begun to intentionally leave missions unfulfilled because of too few submarines, the situation will only grow worse as the fleet levels off near 50 boats. "We must take actions now to stabilize the Force so that we'll go no lower than 50 in the long-term term," said Giambastiani.

And that presents a very steep challenge.

The chief reason for this is the navy's own plan for buying new submarines to replace older ones that will be decommissioned in coming years. Simply put, the Administration and Congress have yet to provide sufficient funds for the navy to replace its older submarines at a pace that will keep the Force from dropping below 50 submarines.

Present plans call for the Navy to buy one Virginia class submarine each year. At that rate, the Submarine Force will stay at 50 boats until 2013, but will drop below 50 boats in the years after. That is because at that time, the Navy will be decommissioning improved Los Angeles class boats at the steeper rate of nearly two per year, a reflection of their healthy building rate in the 1980s.

If not corrected, a one-per-year submarine production rate would result in a Submarine Force that drops below 50 boats by 2013 and reaches a low of about 30 boats by 2030.

Navy Secretary Richard Danzig confirmed to Congress on

March 3,1999 that the Administration's current plan is to build one Virginia class boat per year. However, he cautioned that "over the longer term we need to get to higher build rates". He made clear to Senators that he is "not a fan of declining fleet size. More is better. More ships give us more versatility ..."

Increasing the build rate to one-and-a-half Virginia class submarines still won't prevent the Submarine Force from dropping below 50. That build rate would see the Force drop below 50 by 2015 and would result in a long-term Submarine Force no larger than about 38 vessels.

Compounding this future problem is the slow pace of submarine construction in recent and coming years. For the period 1990-2005, only 10 attack submarines were procured or planned for addition to the fleet. There was the last Los Angeles class in fiscal 1990, the second and third of the Seawolf class purchased in fiscal 1991 and 1996, respectively, and the first seven Virginia class boats, one in each year fiscal 1998, 1999, and 2001-2005.

Had the building rate during this period instead been based on the need to maintain a 50 boat fleet, 23-27 attack submarines should have been procured during this period, according to an analysis done by Ron O'Rourke, a naval specialist at the Congressional Research Service, an arm of Congress.

"Between now and about 2015, this 13-17 boat backlog in SSN procurement will be masked by the large number of (Los Angeles class) SSNs procured during the 1980s. After about 2015, however, SSNs procured during the 1980s will reach retirement age and begin to leave service, and the fiscal 1990-2005 *deficit* in SSN procurement, if not then redressed, will begin to be unmasked."

By about 2025, O'Rourke testified to Congress, most of the Los Angeles class boats will have been decommissioned, leaving the Submarine Force to drop below 50 vessels for at least a decade.

A key function that helps determine how long Los Angeles class submarines can remain in the fleet is the duration of its nuclear reactor. Just recently, the Naval Reactors office completed a study which found that many Los Angeles class boats can extend their service lives for several years. This will depend upon careful management of their nuclear fuel, but will not impinge upon the submarine's operational effectiveness.

In particular, Naval Reactors found that nine early models of the Los Angeles class, those without vertical launch tubes, can extend

their service lives. Three will decommission after 31 years of service and the remaining six will go after 33 years.

As for the later model Los Angeles class boats, 21 can remain in the fleet for 33 years of service, two can be stretched until 32 years of service is reached. And another can extend its service life to 31 years.

Together, these changes will slow the removal of Los Angeles class boats from the Submarine Force, taking some of the pressure off the build rates needed for the Virginia class. Had all the Los Angeles class boats decommissioned after 30 years of service, the Navy would have had to build three Virginia class boats almost every year from 2008-2026. At $1.5 billion each, a three-a-year submarine building plan would have been difficult to fit inside the Navy shipbuilding account.

Indeed, Rear Admiral Malcolm Fages, Director of Submarine Warfare, told Congress on April 13, "I am concerned with the affordability of an acquisition profile that included the need to purchase up to three Virginia class submarines in multiple years starting in fiscal year 2008." This new plan, he said, "will save a significant among of money in future shipbuilding budgets, while ensuring that we can maintain at least a 50 submarine force."

But with the service life extension on the Los Angeles class boats, the Navy is now looking at buying one Virginia class boat in 2004, 2005 and 2007-2011. After that, the build rate must increase to two per year through 2032 in order to sustain a 50 submarine fleet.

However, even with that build rate and the extended lives of the Los Angeles class boats, there remains a period from about 2026-2032 in which the Force drops to about 45 submarines before recovering. Fages highlighted the urgency of addressing this problem before Congress. "I would tell you that the greatest challenge which we face in the Submarine Force is the challenge of maintaining overall force structure, while the number of Los Angeles class go out of service into the next century."

He explained that a Force level of fewer than 50 submarines, say 25, would be tantamount to abandoning the nation's current national security strategy.

"Those who argue for significantly fewer, for example 25 ... argue that, I believe, from a context of an entirely different national strategy—a strategy in which we are essentially isolationists. A fortress America strategy. A strategy in which we are not forward

engaged."

An examination of the current missions now being performed by the submarine fleet—special intelligence missions like intercepting enemy communications, anti-submarine warfare, special operations forces, countering an area denial strategy—in fact indicates that more than 50 submarines by be needed.

Indeed, the last time the regional CINCs were queried for their thoughts on Submarine force levels, it was determined that 72 attack submarines are what is required. Another such study is ongoing today, being conducted by the Joint Chiefs of Staff. It is looking at the national need for submarines in the 2015-2025 period. Early indications point to a similar conclusion.

These studies bolster the statements made by Rear Admiral Lowell Jacoby, Director of Naval Intelligence, when he told Congress that he would prefer there be a larger number of attack submarines.

"It would probably be in the range of 65 to 75," he told Congress April 13. He said the ongoing JCS study has found that the regional CINCs want twice the number of mission days provided by submarines last year. "Now an element of that JCS study is affordability and the degree to which that will play in the ultimate outcome of the study I can't predict at this time. But the requirements as seen by the warfighting CINCs are for numbers that are significantly higher than 50."

While the final number is yet to be determined, it is clear that the assumptions about the post Cold War, that led to a planned 50 strong Submarine Force, were flawed. The implication of this can be seen in the heavy tasking that submarines receive today from a variety of overseas theaters and in the number of submarine missions that must go unfilled.

Evidence indicates that it is going to be difficult enough to sustain a 50 strong Force. Increasing the Force beyond 50 boats, if called for, will require the annual construction of at least three Virginia class submarines in coming years, a sizable proposition in today's fiscal environment.

The need for a more healthy Submarine Force clearly exists. What remains to be seen is Washington's ability to respond appropriately.■

## *ONKEL KARL* AND UNCLE CHARLIE
### Dönitz and Lockwood: A Comparison of Style
### Part I

*by CAPT Ralph Enos, USN(Ret.)*

> **Uncle** n. [ME, fr. OF, fr. L *avunculus* mother's brother] **1 a:** the brother of one's father or mother **b:** the husband of one's aunt **2:** one who helps, advises, or encourages. *Webster's seventh New Collegiate Dictionary.*

Both Karl Dönitz and Charles Lockwood were affectionately called *Uncle Charlie* by the submariners under their command during the Second World War. What was meant by those cognomens, and a comparison of the character and command style of these two men is examined in this essay.

Charles Lockwood was a kind and thoughtful professional submariner whose wartime reputation was that of a person who looks out for his troops and gives them everything within his power to enable them to do their jobs. He did not overly much interfere in their execution, an avuncular role that fully justified his being called Uncle Charlie. He could be stern and hard if he had to be, but preferred not to.

Karl Dönitz had a similar reputation in the U-bootwaffe. He too was dubbed *Onkel Karl*, but he was also called *der Löwe—the lion*—for his dogged aggressiveness. Since I don't read German, it is difficult to discern what his men may have meant by these appellations. What is clear is that Karl Dönitz's personality and style were substantially different from those of Charles Lockwood.

Their careers had many parallels. Near contemporaries—Lockwood was born in 1890 and Dönitz in 1891—they both were commissioned in their respective navies in 1912. Both married daughters of flag officers while on foreign duty, and both had two sons and a daughter. When the Second World War broke out for their respective nations, they both were relatively junior captains who had specialized in submarining since they were junior officers.

Charles Lockwood was a product of mid America. Born in southwestern Virginia, but raised in Lamar, Missouri, he came from a close family that lived the typical life of the middle class so common in rural America at the turn of the century: essential needs

taken care of, but nothing much left over for frills like going to college. Lockwood later said of his summers of fishing and hunting and hanging around: "Tom Sawyer would have felt at home". He went to the Naval Academy in 1908 because the education was free, and because he always had a yen for the life at sea.

Karl Dönitz was born in Grunau, a suburb of Berlin, and raised in Jena, a prosperous university town on the Saale River in Thuringia. His father was an engineer with the Zeiss optical works and young Karl was raised in a typical prusso-german environment: stiff, formal family relations in an upper middle class home. His mother died when he was five and his father when he was 22. He attended private schools and had summer vacations on the Baltic where his experience in sailing led him to join the navy in 1910.

The navies were similar into which the two were commissioned in 1912. Both were *arriviste* compared to the British Royal Navy. The *Kaiserlichtenmarine*, under Navy Minister Tirpitz, had expanded from a modest coast defense force in the 1890s into the world's second most powerful, and was sufficiently worrisome to Britain that a battleship building race ensued. The United States Navy had a more ancient lineage, but after the Civil War had been neglected. Only in the mid 1880s did the Navy begin to remake itself. In 1912, the U.S. Navy was a close third behind Great Britain and Germany, and growing fast.

Naval strength in 1912 was measured in battleships and it was in large warships that a naval officer made his mark. Submarines were so new to the world's navies that they weren't on a naval officer's career horizon. Submarines were slow, vulnerable, short-ranged, small, unreliable if not quirky, cramped, noisome, and dangerous. Submariners were raffish, disreputable, unconventional, and besides smelling bad, had poor career potential. Lockwood was posted to a new dreadnought, USS ARKANSAS, and Dönitz to a new cruiser, SMS BRESLAU. When, in 1914 for Lockwood and 1916 for Dönitz, service needs posted them to submarines, neither was an eager volunteer.

In Dönitz's case, however, the submarine had taken on a new aura since the World War had broken out in the summer of 1914. Intrepid skippers like Otto Weddigen had boldly taken their tiny boats into British waters and scored impressive victories. No longer just coast defense toys, submariners had become the heroes

of the Imperial Navy. Dönitz may not have been happy with his new posting—he had been enjoying a kind of dashing, carefree life in BRESLAU, then in the Turkish naval service—but he was ambitious enough to realize his navy's future lay in submarines.

Dönitz's time in WWI submarines lasted about two and a half years, and included combat and adventure. He apprenticed under the legendary Walter Forstmann, making four Mediterranean patrols in which Forstmann sank 32 ships. Later he commanded UC-25, a small minelaying boat, in which he made two Med patrols, planting minefields and torpedoing five ships. These patrols had their adventures; he boldly sneaked into Augusta Bay, Sicily and sank a coal barge which he mistook for a repair ship. On the way home he ran aground trying to endrun the Straits of Otranto mine barrage. The sinking outweighed the grounding, and he was awarded the Knights Cross of the House of Hohenzollern. In command of the larger UB-68 in October 1918, Dönitz was forced to the surface when attacking a convoy, scuttled his boat, and was taken prisoner.

After his tour in ARKANSAS, Lockwood requested duty in the Asiatic Fleet, no doubt seeking adventure. His request was granted but when he got there, much to his dismay he found himself in command of the third oldest submarine in the Navy, A-2. His disgust rapidly turned to delight and he spent most of the rest of his career in the submarine service. He had virtually every duty associated with submarines except that of junior officer. He came aboard his first boat as nominal commanding officer, although he could not take her underway until qualified by his division commander, and commanded six subsequent boats (B-1, G-1, R-25, S-14, V-3, and the ex-German UC-97). Much to his regret, he never saw combat action in a submarine, although he did get shot at more than once as commanding officer of a Yangtze River gunboat on the China Station.

Dönitz was out of the U-Boat community from his repatriation in 1919 until he was named commander of Nazi Germany's nascent U-Boat flotilla in 1935. From that time until he was named Hitler's successor in April 1945, he commanded Nazi Germany's U-Boats. Lockwood, in contrast, spent several important tours in submarine jobs during the interwar years, and was never in command of all American submarines. From January 1943 on, Dönitz was navy commander-in-chief and commander of the U-

bootwaffe. At nearly the same time Lockwood became the most influential American submarine commander as ComSubPac, but he was always subordinate to CincPac Nimitz and COMINCH King.

The different command relationships the two uncles were in had a great deal to do with their different styles, but in a couple of crucial areas their personalities and temperaments dictated their style in spite of command arrangements. Dönitz was obsessed with wolfpack tactics (*Rudeltaktik*) as the way to defeat convoys. The way his force implemented the *Rudeltaktik* required his close involvement in tactical decisions. This obsession came to rule his strategy, and even though objective evidence was available that showed this strategy was losing, Dönitz clung to it and twisted his logic to serve his obsession.

Lockwood always believed the on-scene commanders to be in the best position to dictate tactics, and seldom interfered, even when Ultra intercepts gave him far better information on enemy movements than Dönitz ever dreamed of having. Lockwood, of course, would move his boats around to deal with developing situations that were clearly not known to the on-scene commanders. But when the fog of war descended on ComSubPac headquarters, he would leave his boats alone and trust the COs. Rarely did he second-guess his CO's decisions in his endorsements of their patrol reports.

Dönitz's problem was that the fog of war never lifted from U-boat headquarters. He depended on U-boat pickets to spot convoys rather than nonexistent air reconnaissance, probably the worst such platforms imaginable for that duty. These boats had to be on the surface and were able to elevate their lookouts only about 15 feet above the water, they had no radar, and they had bad weather most of the time. In order to stretch such pickets effectively across all possible convoy routes required hundreds of U-boats; Dönitz never had that many. If a U-boat picket were lucky and spotted a convoy, the *Rudeltaktik* required the sub to report immediately and then to shadow. Based on the report, Dönitz would vector a large number of U-boats to converge on beacon signals from the shadower, and when in place, overwhelm the convoy. It rarely worked that way. At first, he had insufficient numbers of boats at sea to muster an adequate picket line or an overwhelming pack. When he finally, in late 1942, had upwards of 100 boats at sea at one time, the enemy had sufficient air power, well trained escorts,

radio direction finding, and signals intelligence to frustrate the tactic.

Lockwood was never in a position to dictate grand submarine strategy as Dönitz was, and he was never wedded to a particular tactic. He was faced from time to time with failure on the part of his boats to accomplish a mission. Bur rarely did these failures show a pattern like the U-boat failures did. The torpedo failure syndrome was probably the closest American submarines came to experiencing systematic failure, and this baffled shore commanders who were willing to assign blame elsewhere than where the boats said they should.

Lockwood was the exception to this early on. He is revered in the American Submarine Force as the hero of the *torpedo scandal* because he took the lead in conducting tests to determine that torpedoes were running deeper than set, and he took this action immediately after taking command of SoWesPac submarines. He is also held to be a hero for arranging tests at Pearl and Kahoolawe that pinpointed the jamming contact exploder.[1]

Dönitz, too, had his problems with torpedoes, problems that were eerily similar to those of the Americans. His torpedoes ran deeper than set, they had a magnetic exploder that was unreliable, and they had sticking contact firing pins; one problem masked another, their prewar ordnance establishment had not tested the torpedoes adequately, and the same people that tested the torpedoes were also responsible for accepting them. German U-boats were called upon to defend the precarious Nazi position in Norway in 1940 against British naval counterattack, much as American subs were expected to defend the Philippines against Japanese naval assault. In each case the submarines failed dismally, and a great deal of the failure was due to faulty torpedoes. The reactions of the two submarine forces were quite different. The Germans pounced on the torpedo problem; the Americans found excuses for not acting.

This difference was due to some extent to the fact that Dönitz's

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[1]This image is a bit tarnished when one considers that these tests took place in late summer 1943 and only after Dan Daspit showed up in TINOSA with incontrovertible proof that there was a problem with the contact exploder. No commander could have ignored that. That was almost eight months after Lockwood became ComSubPac!

force had seven months of combat experience behind it, before the Norway campaign. Also, Dönitz had been hearing sporadic reports of malfunctioning torpedoes since the war started. When trusted commanders like Gunther Prien complained about torpedoes during the Norwegian campaign, Dönitz listened. Within a week Raeder convened a court of inquiry that ultimately led to the court martial of high ranking officers of the torpedo directorate.[2]

This points to a fundamental difference between Dönitz and Lockwood: Dönitz really was not particularly interested in weapon design. He left this to the uniformed engineers in the Kriegsmarine. He once complained in his war diary of the amount of time he had to devote to the torpedo problem, taking him away from important stuff. Lockwood had learned submarining from the keel up. As a junior officer, he was the only officer on board his boat along with a crew of maybe eight enlisted. He had no choice but to learn everything about that boat—its engines, pumps, torpedoes, batteries, periscopes, everything. When a weapon needed recovering from the bottom, he was the qualified diver to go down and get a line on it.

This involvement in the technical details of his boat was, of course, necessary for early submariners and has remained a hallmark of American submariners to this day. But in the German navy a different tradition developed. Here the chief engineer was responsible for the mechanical and electrical functioning of the boat. The line officer—which Dönitz was—fought the ship. Although the boat's torpedoes weren't the chief engineer's responsibility, the tradition on non-involvement in technical things inhibited an officer like Dönitz from learning his torpedoes inside and out.

In contrast, Lockwood relished digging in and moving his equally knowledgeable staff—guys like Momsen, Pieczentkowski, Taylor, and Johnson—to solve the torpedo problem in Hawaii, rather than at Newport.

If Dönitz was obsessed with the *Rudeltaktik*, then Lockwood

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[2]This immediate and high level investigation didn't solve all the U-boat's torpedo problems. Their deep running problem persisted for another two years until the cause was accidently discovered. Nor did Germany solve their contact firing pin problem or the magnetic pistol problem; they merely adapted a British design to their service use and turned off the magnetic feature.

was obsessed with penetrating the mined entrance to the Sea of Japan with "Hells Bells", the QLA fm sonar developed by the University of California Division of War Research at Point Loma. It didn't start out as an obsession; in fact it was a sound operational objective. But delays in development dragged on and one. By the time "Operation Barney" was launched in June 1945, it had become an obsession with Lockwood. How else can one explain a dangerous operation against an enemy that had been obviously beaten?

Lockwood's interwar experience prepared him for wartime command of the Submarine Force in a way denied to Dönitz. Dönitz had no duty in submarines from 1918 to 1935. Lockwood, by contrast, was commissioning skipper of V-3, one of America's interwar attempts to design the ideal fleet submarine, and his later duty as a division and squadron commander, staff officer, and member and later chairman of the Submarine Officers Conference kept him on top of and contributing to the latest American submarine designs, equipment, and tactics. Lockwood, along with Edwards and English, had a great deal of influence on the successful Gato class design.

Dönitz, who had much less experience in commanding submarines than Lockwood, and much, much less experience in working with submarine designers, nonetheless held very strong views on submarine design and construction. He felt the Kriegsmarine should concentrate on just two or three submarine designs and build huge quantities of these. The types he settled on were the small, coastal Type II, the mid-sized Type VII, and the long-range cruising Type IX. Of these he particularly favored the Type VII—not because it was superior—but because it was an ocean-going design that he could obtain large numbers of at a reasonable cost. That the Type VII was ill-suited for most of the tasks assigned to it seems never to have dawned on him (or several generations of western commentators, who continue to praise the Type VII).

The Type VII was a poor surface sailer, had no radar or sonar (just listening gear), and carried a small number of torpedoes. It was a miserable ship for its crew—cold, damp, and crowded in the North Atlantic; broiling hot in the tropics. Its submerged speed was not exceptional, and although its top surface speed was high, it rarely made top speed because of weather or mechanical

breakdown. Its engines were not particularly reliable; dozens of patrols were aborted because of engine trouble. Many more patrols were cut short because all torpedoes were expended or fuel was short.

I doubt that any conventional submarine design—that is, a boat without a snorkel that had to surface to charge batteries and to make any kind of distant or fast transit—would have better withstood the terrible conditions in the North Atlantic than did the Type VII. But that isn't the point. The Type VII was not suited for the tasks assigned to it: defeating the British and allied merchant marines guarded by the British Navy in the North Atlantic. Its technical shortcomings masked the human failure of the German naval command to recognize them and either correct them, or assign a better-suited weapon system to the battle, or, failing that, abandon the attempt. No person stands more responsible for this human failure than Karl Dönitz.■

*Part II will appear in the October 1999 issue of* ***THE SUBMARINE REVIEW.***

**IN MEMORIAM**

RADM Rafael C. Benitez, USN(Ret.)
CAPT Ray Paul Jones, USN(Ret.)
Mr. Mickey S. Michaels

# FAST ATTACKS AND BOOMERS: SUBMARINES IN THE COLD WAR
## The Centennial Cold War Exhibition at The Smithsonian National Museum of American History

*by CAPT John Shilling, USN(Ret.)*

### The Concept

With the full support of the Director, Undersea Warfare (N87), the idea for an exhibition to commemorate the Submarine Force Centennial in 2000 was presented to Dr. Spencer Crew, the Director of the Smithsonian National Museum of American History (NMAH), on 15 January 1998 by Admirals Kelso and Burkhalter Vice Admiral Don Engen, USN(Ret.), and Director of the National Air and Space Museum, arranged for the presentation at the request of Admiral Kelso.

Readers may recall that in 1993, the National Air and Space Museum proposed an exhibition commemorating the 50th anniversary of the dropping of the first atomic bomb on Hiroshima by the Enola Gay. A headline making debate arose over the historical interpretation emphasizing the horrors of the results; at the expense of the historically accepted view that the atomic bomb saved millions of American lives by negating a costly invasion of homeland Japan. Subsequently, the Museum's Director and Exhibition Curator were replaced. The Enola Gay exhibit finally opened in 1995. The experience left a legacy of sensitivity to exhibitions of a military nature throughout the Smithsonian Institution.

Thus, when the Naval Submarine League proposed celebrating nuclear submarines, the memories of the Enola Gay issue still resonated within the Institution. Thanks to the support and encouragement of Don Engen, our team gained an entrée, made a persuasive presentation, and the rest, as they say, is history. Within three weeks conditional approval was granted to proceed with a concept portraying the story of the major role U.S. submarines played in the Cold War victory.

### The Start-Up

Our initial meetings with the NMAH curators identified two

issues that required fast management attention. The first, we were about one year late in starting the project, and the second, it was going to be far more expensive than our uneducated estimates anticipated.

The size of the available exhibit space, as in building a home, is a significant cost control factor. Initial estimates were that we could plan on about 3000 square feet—not much space for such a complex and significant story to be portrayed. It became immediately apparent that we needed help in guiding us through the unfamiliar minefields of the *museumology op areas*. Ideally, we were told, the process would be to have a designer design the piece, and then hire a company to build and install it. Several interviews later, it was evident that this series approach would not achieve the schedule milestones. Fortunately, we found an outstanding local Virginia company, Design and Production, Inc., to design, produce and install the package and, most importantly, they enjoyed a good reputation with the NMAH team. Initial scoping of the project revealed that it would cost in the neighborhood of $2,000,000 and could be ready to open in April 2000 with a very aggressive team approach.

Our next hurdle was to gain NMAH's agreement to deviate from the traditional contract structure wherein the client (NSL) gives the money to the museum, which in turn hires and manages the contractor. Based on a growing understanding of the workings of the museum and the need to move quickly, we decided that the optimum arrangement would be for the NSL to contract separately with D&P and the NMAH. After much discussion, the NMAH curators agreed. A Letter of Agreement (LOA) with the museum is nearly completed that lays out the interfaces and procedures to be followed among the three participants. The LOA further guaranteed NMAH the final approval for everything that went into the exhibit. This approach resulted in a management teaming arrangement that bought all participants together early on, streamlining the management process, eliminating red tape, and most importantly, bringing the responsible people together to work the plan. Working closely with Dr. Steve Lubar and Dr. Paul Johnston of the Office of Curatorial Affairs, and Eleanor Boyne, the Project Manager, we have moved ahead and are confident of completing on schedule.

## The Story

With our structure in place, the next issue was what goes inside it? Trust me, readers, there was no shortage of *suggested* topics and *essential* artifacts from the submarine community once the word got out of our plans. Many historians and retired submariners gave us valuable input that helped us shape the design concept. A Submarine Centennial Exhibition Advisory Panel was assembled, made up of members from the NMAH, the U.S. Naval Historical Center, the Navy Museum, the NSL, and other experts in the submarine role in the Cold War. Rear Admiral Shap Shapiro, former Director of Naval Intelligence, served as our intelligence mentor and filled the role of the *wise man* in some of our more contentious discussions.

Our first requirement was to educate our designers and curators in all aspects of submarines. With the help of N87 and the hospitality of several commands, we were able to have the team visit New London, Norfolk, and Bangor. They went aboard SEAWOLF, TREPANG, POLK, and MICHIGAN in the course of their visits. Support activities at those sites also were part of their indoctrination. The team visited Electric Boat and Newport News and gained insights into the history and techniques of designing and building our ships. Trips to the Undersea Warfare Museum, Bangor, Washington, and the Nautilus Museum, Groton, Connecticut were especially valuable in focusing the views of the team.

These visits along with many meetings, papers, e-mails, phone calls, and briefings resulted in the Design Concept that is being produced today. The theme of the Exhibition was to portray the largely unheralded contributions of the Submarine Force during the Cold War period. Our SSBNs in the strategic role were a well publicized arm of the Strategic Triad throughout the Cold War. On the other hand, our SSN operations have been rightfully kept in the classified world.

Underlying this theme was the need for visitors to understand the infrastructure that allowed us to develop, produce and man these incredible machines. So, we determined that in setting the scene for the telling of the mission story, we would show the following fundamental pieces:

- **Cold War History.** A large segment of the viewers under 25 will have little or no understanding of the origins or

issues in the Cold War.

- **U.S. and Soviet Submarines.** Who were the players in this underwater duel that endured for more than 30 years? Where did they operate?
- **Submarine Weapons.** Although none were fired in anger, the threat of the formidable array of missiles and torpedoes carried aboard our ships was a deterrent to Soviet aggression.
- **Submarine Construction.** The ability to design and produce our quiet and swift submarines at high construction rates was critical to our victory.
- **Nuclear Propulsion.** Our power plants—safe, quiet, and reliable—were an undergirding factor in every operation conducted by our subs in the Cold War.
- **Life on Board.** As Sundance asked Butch in the film, *Butch Cassidy and the Sundance Kid*, "Who are those guys?" We plan on showing the visitors not only who "those guys" were, but also will portray how they lived in crowded spaces, with few comforts, for months on end, and were always ready to carry out their missions.
- **The Missions.** Although never asked in the movie, the key question for us will be, "What did those guys do?" We will **not** replay the recent best selling book, *Blind Man's Bluff*. We will, however, present operational vignettes, using videos and still photos that have recently been declassified by N87 and the Director of Naval Intelligence. This material from actual mission reports will be portrayed dramatically in the Attack Center portion of the show.
- **The Families.** The *girls we left behind* were the anchors in our sailors' lives. The story of their experiences and sacrifice will be revealed. The trials and tribulations, the coping, and the mutual support of the families ashore will also be a part of this story.
- **Present and Future.** As the visitors exit the exhibit, there will be information describing the Submarine Force today and a preview of the new technology and submarine development efforts aimed at maintaining our undersea superiority.

## The Audience

To tell such a story in a small space is a challenge that our design team met with ingenuity and creativity. Consideration of the audience became a dominant factor in our deliberations in pulling together the design. A few that were considered are listed below:

- The audience will be predominately civilians, not submariners. The message here is, "Keep it simple!"
- NMAH receives about 5 million visitors a year made up of a variety of age groups, educational backgrounds, and geographic origins. Thirty percent are under 24 years old and 38 percent are in the 25-44 age group.
- Visitors average only 90 minutes at the NMAH. The Exhibit's challenge is to capture as much of their time as possible to visit our exhibition.
- The American Disabilities Act contains many specific guidelines that we must comply with in presenting visual and audio information.
- Sensitivity to impact on the flow of visitors through the show influences the sequence and placement of exhibit artifacts and displays.
- Sound management is critical to the presentation of audio/visual information. Interference among the audio experiences must be avoided.

## The Hardware

Now that we understood the goals and the limitations of our project, the next step was to choose the best way to present the messages. Since we couldn't fit a submarine into the small space, we chose to bring as many pieces as possible to add reality to the visitor's experience. With the help of a number of Navy commands, we were given access to one of our nuclear submarines, USS TREPANG (SSN 674), that was soon to be deactivated at Puget Sound Naval Shipyard. Visits to the ship in Groton before it was decommissioned established a positive and cooperative attitude on the part of the ship's company. Likewise, the personnel at Puget were briefed, and signed on willingly to handle the

equipment removals with care. The Director Strategic Systems agreed to support our efforts in the strategic submarine story by providing artifacts, models, and graphic materials. A visit to USS POLK (SSBN 645) resulted in a source of additional strategic submarine artifacts. Finally, USS SANDLANCE (SSN 660) was included as the source for the piece on nuclear propulsion.

Our exhibit will contain many items from TREPANG, POLK, and SANDLANCE. A listing of the larger ones follows:

| | |
|---|---|
| Watertight Door | Trash Disposal Unit |
| Torpedo Storage Skid | Bunks from Crew's Berthing |
| Torpedo Loading Hatch | Mess Tables and Benches |
| Bridge Access Hatch | Commode |
| Ballast Control Panel | Steam Control Panel* |
| Ship Control Station | Reactor Plant Control Panel* |
| ESM Console | Electric Plant Control Panel* |
| Sonar Room | Periscopes (partial) |

* These three consoles required declassification. Our nuclear shipmates can appreciate the challenges faced by Naval Reactors engineers and security people in, for the very first time, deciding on how to present these panels to the general public. Additionally, our friends from Puget Sound Naval Shipyard assured safe handling by removing all three as a single unit, steel decks included, from SANDLANCE. This became known to the EB and Sub Base personnel who would prepare the units for the Exhibition, as the "Big Box"—14,500 pounds in a container whose dimensions were 15'x7'x10'! Not expecting the consoles to arrive in a single container, the repair people at the Sub Base were unable to fit the container through the door to the building set aside for the declassification. As a result, occupying at least three reserved parking spaces, it remained outside for the six winter weeks that an EB Tiger Team did the declassifying work. A small entry door was cut in the side, and heat and light were installed inside the "Big Box". After the job was completed, the Big Box was shipped to D&P in Lorton, Virginia where it now resides pending transfer to the Museum. We are making plans to donate the "Big Box" to the Habitat for Humanity as a prefab home for a small family!

To further recreate the feeling of being *inside* a submarine on patrol, we will also mount the smaller bits and pieces that surround

these larger items: battle lanterns, telephones, valves, switches, EAB manifolds, lighting fixtures, cable and pipe runs, etc. Mk 48 torpedo and Tomahawk shapes will help in portraying to the visitor an understanding of the weapons, and their. The Shoreside Families piece will feature many personal artifacts such as old family grams, family photos, and other personal memorabilia.

## The Medium

How will we bring this hardware to life and make it a dynamic part of the story we are telling?

Thanks to modern technology and the imaginations of a lot of smart people from the NMAH and our design team, we hope to provide a vivid audio/visual experience for the visitors. Well-written labels for the artifacts and graphics will allow the visitors to learn the meaning and value of the object or photo. Our plan includes a wide variety of interactive screens available to visitors to heighten their experience and understanding. Through the use of actual recorded shipboard sounds, periscope photography, sonar displays, lighting effects and recorded voices we will portray life on board at work and play in a lively and thouoght-provoking manner.

## Summary

Perhaps one of the most satisfying rewards for me in working on this project, has been the 100 percent willingness to support the Exhibition on the part of everyone that I have come in contact with during the past 16 months. Navy commands, contractors, historians, submarine officers and crews, the Smithsonian team, and many retired submariners have given freely of their time and resources to bring this idea to fruition. Rear Admiral Hank McKinney and Captain Peter Boyne have been active co-conspirators in the management and shaping of the project.

On April 12, 2000 the FAST ATTACKS AND BOOMERS; SUBMARINES IN THE COLD WAR Exhibition will formally open with an evening reception hosted by the NMAH and the NSL, beginning a minimum run of three years. We hope you can visit and relive some of your greatest moments as submariners and Cold War victors.

*And, finally, if you have not yet made a contribution to the Submarine Centennial Fund, now is a good time to send in a check and help ensure that we can present this show as planned. We are still short of the funds needed to complete it.*■

## SUBMARINE CENTENNIAL UPDATE

Planning and preparations continue to unfold as 2000 approaches. The Submarine Force Centennial website will be accessible via the newly designed Navy Homepage: http://www.navy.mil. The Navy Homepage, with more than 4 million queries last month, will, for the first time, provide direct access to the Submarine Force Centennial site; the Submarine Warfare Division (N87) site; and the Undersea Warfare magazine site and submarine-related Navy fact files. Once you access the Navy Homepage, click on THE SHIPS button; then click on the Submarine icon. You will then be able to choose from several interest areas of your choice.

If you choose to bookmark the only Submarine Force Centennial site URL for future access, use http://www.chinfo.navy.mil/navpalib/ships/submarines/-sub100/html.

In the Submarine Force Centennial site, the Submarine Centennial Events page includes latest updates of significant Centennial ceremonies, tentative dates and locations. If you have further update information, please contact either CDR Mike Poirier, N87C1 (OPNAV Submarine Force Centennial Coordinator) (703) 697-1565 (e-mail: poirier.michael@hq.navy.mil) or CDR James Taylor, N87P (OPNAV Submarine Force Centennial Liaison Officer (703) 604-7828 (e-mail: taylor.james@hq.navy.mil.

## AUSTRALIA'S COLLINS CLASS SUBMARINES

*by Dr. Dora Alves*

*Editor's Note: This article reviews the current status of Australia's Collins class submarines and the criticisms being levied against the project. Since the design and acquisition of these submarines represents a significant policy and industrial step in the acceptance of submarines as a primary national security force for regional powers, this article is presented as a matter of prime interest for the U.S. submarine community.*

The Royal Australian Navy's Oberon class submarine, HMAS OVENS, commissioned in 1969 and withdrawn from service four years ago, is being prepared on a Fremantle slipway for display in the West Australian Maritime Museum, a gift from the Federal Government. The Oberons are being replaced by six, or possibly eight, Collins class submarines, based on Type 471. In the last few years the RAN has taken the lion's share of new capital equipment spending for the services.

In the buildup to Australia's 1998 general election there was much adverse media comment on Kim Beazley's choice, as the then Minister of Defence, of the Swedish Kockums Type 471 submarine. Members of the Howard Coalition government were not averse to having Beazley, now Leader of the Labor Opposition, associated with the costly submarine project's emerging defects and delays.

Politicization of the project occurred not only at federal level. Port Adelaide's selection as the construction site for the Collins class gained the Australian Submarine Corporation and other South Australian based firms opportunities for combat systems that included advanced radar, sonar, and other electronic devices, weapons, targeting and launching equipment, and computer software. Competition among the states had been fierce, not only prestige but new jobs and improved industrial skills were at stake.

Beazley changed Australia's defense thrust to the defense of Australia on an independent basis. He wanted to project a coherent strategic capability into Southeast Asia and the South West Pacific with a two ocean navy, based on both east and west coasts. Recently, there has been support for two additional submarines, at approximately half a billion Australian dollars each. This has occasioned a swelling chorus of criticism based on leaked data

regarding the submarine's acoustic signature and a so-called *damning U.S. report*. The Chief of Navy, Vice Admiral Don Chalmers, denies that a U.S. Navy report on the Collins class program was damaging to either the project or to the RAN.[1] Some of the ill-informed critical barrage involved distortions of the truth and little understanding of a navy's capabilities. At least one vitriolic commentator made reference to the back of the boat.

One of the world's largest conventional submarines, at about 3,000 tonnes, the Collins class, based at HMAS STIRLING, on Garden Island, near Fremantle, is expected to serve until around 2025 under peacetime conditions. They will be a deterrent to potential enemies and, with the F-111 strike and F-18 fighter forces, defend the air-sea gap to the north of Australia. Australia cannot afford a nuclear submarine force and has no nuclear engineering industry. At the time that the decision was made for the Type 471 anti-nuclear feeling was strong in Australia. No submarine producing countries had conventional models with the range and capabilities required for Australia's strategic circumstances and weather and sea conditions. A credible submarine force needed much of the work to be done in Australia. Requirements were still in the planning stage, and from the start it was expected that upgrades would be made to meet evolving needs. Four of the Collins class have been launched. At present none have been fully certified for combat operations, although HMAS COLLINS and FARNCOMB have been provisionally accepted into service. HMAS WALLER is undergoing trials.

In March 1998, the press, with such headlines as "Out of Their Depth", and "Sub Standard", gleefully criticized the efforts of the Defence Department's project management of the new submarine program after auditors noted "numerous defects discovered late in the construction" of the Collins class. However, the Coalition's Minister of Defence, at that time Ian McLachlan, welcomed the findings of the Australian National Audit Office. He was encouraged by the assessment that the Collins class, still expected to come in within budget, had the potential to achieve the capability specified in the 1987 contract. He noted that a period of testing and evaluation had been anticipated before the submarines' acceptance into naval service since the ambitious requirements extended the technology available at the beginning of the project. On March 26, 1998, the *Australian* reported that the auditors had found most of the quality problems were discovered in items

supplied from overseas which the project team had had little chance to scrutinize during construction.[2] The report also commented that, despite unresolved management and technical problems, there had been achievements that demonstrated the capacity of Australian industry to produce to world class standards.

There have been three categories of problems. The RAN admits that with hindsight it might have ordered things differently, but it is confident that problems with the combat system can be overcome. France, the United Kingdom, and the United States have all encountered similar delays when installing new technologies.

The Collins class was planned to patrol for 70 days. The greater a conventional submarine's range, the more food and fuel is required. Consequently, there is less space for crew, hence the need for more automation. Because they are larger, nuclear submarines do not require the compact, highly integrated system proposed in the 1987 contract for the Collins class. The system, called SIMS/SIS Shipboard Information Management System/Shipboard Information System), aims to pull together monitoring and maintenance for every system on the submarine, from crew to engines. Each submarine has two systems, with their own power, monitoring everything and keeping records of all crew members, their skills, and training. This immensely complicated advanced data management system uses more computer power than a space shuttle.

The RAN will not accept the media's blithe recommendation to scrap the system, designed to be controlled from any one of the seven onboard consoles, and throw it away. Instead, it has chosen to bypass some of the problem areas, adapting the system so that improvements can be added over time. Boeing Australia's business development manager (naval combat systems), referring to the most sophisticated development task in Australia's history, claims to be "delving into the outer edges of the envelope" and meeting the technical challenges.

Stealth is the second problem. While it was admitted that the Collins class was aiming for capabilities not found before in conventional submarines, as the noise problem became apparent there was a perception that the entire project was a serious mistake. Sententious articles were written about the compromising of a submarine's essential tasks of remaining undetected in whatever operational role is necessary. The Australian Submarine Corporation's director, Hans Ohff, was astonished that a normally closely

held secret, the noise signature, should be debated in public. The worst problem, involving cavitation, was solved by a bit of fine tuning. The original propeller has been redesigned, and is said to be performing well. The RAN is looking at other propeller designs in case they are needed. There is still some debate between the RAN and the Australian Submarine Corporation about the unusual dome shaped bow of the boat and the taper of the stern casing. The Collins class was originally designed to be quiet at low speed, according to the 1985 specifications. Since then the RAN's operational doctrine has evolved as a result of working with UK and U.S. nuclear powered submarines. Ohff points out that with higher speeds a conventional submarine needs to snort more often, making it more readily detectable.

The U.S. Navy was asked to review the acoustic signature data and the RAN's potential solutions. The David Taylor Naval Ship Research and Development Center, which tests scale models of U.S. submarine designs, will later this year test a 1:10 scale model of a Collins class submarine with revised casing. In Vice Admiral Chalmers' view, in the conditions in which the submarine would operate on patrol, it does very well. The admiral has pointed out that the Oberons are now quieter than when they were built, in fact, they are quite different submarines. The admiral wants to use COLLINS as a development submarine and then transfer the developments to other submarines.[3]

The engines have been another challenge. In January 1999 it was reported that design changes were necessary to stop seawater seeping into the diesel engines. The Swedish design, adequate in calmer northern waters, proved unreliable in the much rougher seas off the Australian coasts. In a written reply to the *Adelaide Advertiser*, the RAN blamed the gravity separators which had occasionally failed to remove salt water from the fuel before it reached the engines. All six Collins class will be fitted, at small cost, with gravity coalescers from within the total project cost. Last September, HMAS FARNCOMB was stranded in Darwin harbor as a result of different engine faults.

Critics of the new submarine seldom compare the capabilities of the Oberon and Collins classes. Commander Mel Rose, captain of HMAS WALLER, has pointed out that while the Oberon class are limited to single figures in detecting and generating target tracks, the Collins can track contacts running into three figures. The Oberon class can fire and control two weapons, whereas the

Collins will be able to fire six and has already demonstrated that it can fire and control four.[4]

With the benefit of hindsight, critics with little comprehension of naval and strategic concerns, have made comments about Australia straining to "punch above our weight". Nonetheless, the adaptation of a Swedish model to Australian requirements, the meshing of contributions from diverse sources, and the foresight and determination of the many civilian and service personnel involved have been commendable.

Early in March 1999 Deputy Chief of Navy Rear Admiral Chris Oxenbould conceded that delays of 20 months in the project had left Australia with a reduced capability in the short term. The last of the Oberon class, HMAS OTAMA, could, however, be decommissioned at the end of 2000, rather than 1999, by which time the Collins class would be fully operational.

On March 18, Minister of Defence John Moore released the terms of reference for a Submarine Review team consisting of Dr. Malcolm McIntosh, chief executive of CSIRO (the Commonwealth Scientific and Industrial Research Organization) and former BHP (Broken Hill Proprietory Co. Ltd.) chief executive John Prescott. Hans Orff, managing director of the Australian Submarine Corporation, noted that none of the five internal and external inquiries of the project had found any evidence it was unsuccessful.

The Opposition offence spokesman claimed that the review was prompted by pressures from "ill-informed, trouble-making, and irresponsible government backbenchers."[5] Labor was confident the Navy had the project well in hand.■

NOTES

1.*Australian Defence Magazine*, December 1998-January 1999, p. 10.

2.*Australian*, March 26, p.3.

3.*Australian Defence Magazine*, December 1998-January 1999, p. 11.

4.Ibid, p.12.

5.*The Australian*, March 13, 1999, p.6.

# THE SILENT SERVICE IS ON THE AIR
## How Advanced Communications Will Revolutionize Submarine Warfare

*CDR Frank C. Borik, USN*
*COMSUBRON THREE*
*Deputy for Operations*

### Introduction

Communications with nuclear-powered submarines has been historically difficult and is often frustrating, particularly when conducting coordinated task group operations. Operational constraints normally require that submarine communications periods be either brief and infrequent while at periscope depth, or slow and unidirectional (shore-to-ship only) while deep and on patrol. The difficulty in talking to us is perhaps one of the (many) reasons why we are called *The Silent Service*. But the introduction of reliable, high-bandwidth communications equipment is putting submarine operations at the cusp of a revolution, and with commercial-off-the-shelf (COTS) technology, we are doing it now.

### History

Modern submarines are designed to operate submerged for extended periods of time; hence, any effective submarine communication scheme needs to optimize the submarine's ability to remain at search depth. Communications are possible for submarines at search depth, but are currently limited to relatively slow shore-to-ship communications using very low frequency (VLF) and extremely low frequency (ELF) bands. Reception of these signals mandates that the submarine moves slowly and trails a floating wire antenna, which limits the ship's maneuverability. While this is acceptable for a ballistic missile submarine (SSBN) on patrol, it places too many operational constraints on the attack submarine (SSN).

A better alternative is to have the submarine communicate at periscope depth (PD) and to limit the length of communications. This alternative allows the submarine more tactical freedom while at depth and has minimal impact on submarine operations if the PD periods are kept streamlined and infrequent.

In the mid-1970s the Submarine Force inaugurated the Submarine Satellite Information Exchange System (SSIXS). This system used ultra high frequency (UHF) high-speed satellite communications and it radically improved submarine operations. Now, instead of waiting at PD for hours to copy the broadcast at the VLF rate of 50 baud, the submarine skipper could come to PD, copy his traffic within minutes, and return to search depth. With a data transfer rate of 4800 baud and a buffer of 64 Kbytes you could copy and transmit up to 15 single spaced pages at a time in a just few seconds. While this was impressive in the 1970s, the system became severely overtaxed in the information-rich 1990s, and this was especially apparent in submarine battlegroup operations.

## Baby Steps

Battlegroup operations are, without question, the ultimate test for submarine communications. In an effort to streamline battlegroup submarine communications, the Submarine Force introduced the Battlegroup Information Exchange System (BGIXS). Although this system used the same UHF satellite communication equipment as SSIXS, putting the equipment on the battlegroup flagship eliminated the middleman and speeded up messages getting onto the battlegroup broadcast. Still, the BGIXS system had the same data rate limitations as SSIXS and was, like SSIXS, limited to sending text only. Furthermore, the BGIXS installation on the aircraft carrier was complex, expensive and permanent. With few units to go around, moving the BGIXS equipment from carrier to carrier became a major proposition. What was needed was something that was simple, cheap and portable.

The solution was BGIXS II. BGIXS II uses COTS computer technology, some specialized software and existing UHF satellite communication circuits to produce error-free data transfer of any kind of digital file. Although the system, whose hardware consists of a laptop computer, a modem and some cables, was designed to be portable, the low cost (approximately $25K) allowed all battlegroups and all submarines to have the system permanently. In addition, the ability to transfer all file types far outweighed the lower data rate (2400 baud for BGIXS II vice 4800 baud for SSIXS). Submarines now routinely send pictures, graphics, even video clips to the battlegroup commander who can use the informa-

tion in near-real-time to more effectively employ his forces.

Still, BGIXS II has limitations. First, the system is stand-alone, requiring an operator to manually transfer information to and from the BGIXS II computer using diskettes (a.k.a. *sneakernet*). Second, the data transfer rate is very slow when compared to what is required to support interactive graphics and web pages. Third, the system is a victim of its own success, and the increased number of users and data volume threatens to overload it.[1] The next logical step would be a system that would have a data rate to allow web browsing, be compatible with the military's secure Internet (Secure Internet Protocol Router NETwork, or SIPRNET), and of course be simple and inexpensive and available now.

## A Giant Leap

In early 1999, the Submarine Force experimented with a new system known as Asymmetric Communications (Asymmetric-COMMS) that met all the above requirements. Much like BGIXS II, the Asymmetric-COMMS system uses COTS technology to leverage significant performance improvements from existing communications systems. Asymmetric-COMMS uses cable modems and routers that allow one-way data transfer of 33 kbps with a 2.4 kbps *reach back* for data transfer and error checking; hence the term *asymmetric*. Best of all, it costs only $160K per installation.

In addition to maximizing the use of the existing submarine communications infrastructure, Asymmetric-COMMS allows access to the military's new SIPRNET network. Much like the cable-modem that hooks into the Internet in many homes, Asymmetric-COMMS hooks up to the SIPRNET ashore at the Navy's regional telecommunications center (NCTAMS). Now, the submarine can communicate directly with anybody in the world who has a SIPRNET address (and vice-versa).

Using the SIPRNET and the attendant e-mail capabilities has significant impact on how we conduct submarine communications. First, the Internet protocols assure error-free delivery of the messages. Second, the messaging system is entirely automated and keeps track of where messages are and where they have been. Third, it is compatible with the new standard military messaging system that is based on SIPRNET e-mail. Finally, messages no

longer have to be screened off the submarine broadcast. Indeed, because of the higher data rate, the submarine can get the information necessary for superior situational awareness in less time. Bottom line: Most of the manual intervention and effort necessary to run a submarine broadcast can be eliminated and the submarine can get more information and spend less time at PD.

And yet, this prompt jump in efficiency is only the beginning. The true power of this enabling technology is in understanding *and using* the efficiency inherent in the network-centric communications that this medium allows. Network-centric communication allows actions and decisions to take place in parallel vice series, enabling our forces to respond faster and with greater effectiveness. And this power has been recently demonstrated in the Navy's latest Fleet Battle Experiment.

## Revolutionize ASW? WeCAN!

Fleet Battle Experiment ECHO was conducted in March and April of 1999 off the California coast. Part of the experiment was to test and validate the concept of Network-Centric communications as applied to anti-submarine warfare (ASW), and one of the great successes of the experiment was the use of web pages and web browsing technology on the SIPRNET to fight the undersea war. Indeed, the Web-Centric ASW Network (WeCAN) proved to be useful beyond all expectations.

The WeCAN is simply a web site posted on the SIPRNET that serves as a central location for ASW information. Information available on the site included such things as environmentals, search planning, commander's intentions, the common tactical picture, and acoustic prediction models. The most exciting parts of the site, however, were the chat rooms. Here were on-line chats of prosecutions, contact reports, tactical decisions, material issues, and (not the least) communications with submarines at PD. In fact, by using the chat rooms, submarines conducted *all* their communications at PD without using voice. The commander and submarine were able to routinely pass contact reports, commanders orders, waterspace management, even blue-on-blue deconfliction; all without the errors that typically result in multiple "say agains" over the voice nets. Thus, the submarine accomplished in 15 to 20 minutes what typically takes an hour or more.

The WeCAN also enabled the planners to develop integrated search plans using all available sensors, and then allowed them to modify the plans in near-real time to respond to changes in the environment and tactical situation. As one example, planners on the command ship were able to link their computers up with the sonar operators' computers on a surface ship and collaboratively plan sonabuoy patterns using a shared electronic *white board*. This allowed the planners to update the plan while the aircraft was enroute so that the modified plan could be executed when the aircraft arrived on station.

The most remarkable event, however, was the efficiency that was created by using the SIPRNET, WeCAN and e-mail. Information was distributed in parallel vice series, enabling the watchstanders to act independently, quickly and quietly without waiting for *someone else* to first handle the information.

## Too Good To Be True?

While Asymmetric-COMMS and WeCAN are very powerful technologies, there are limitations. First, Asymmetric-COMMS needs two satellite channels to operate, and only one submarine can communicate at a time. Satellite channels are scarce and obtaining the necessary channels will most likely mean giving up something else. Even if satellite channels are made available, multiplexing and/or timesharing schemes must be worked out in order to have a viable force-wide communication system.

Second, Asymmetric-COMMS and the WeCAN are not programs of record and, as such, are not currently funded or supported with parts and training. Many argue that this method of *bottom up procurement* is wrong, and certainly lack of sponsorship raises logistics issues. On the other hand, BGIXS II started out as an unsponsored program and it is now sponsored, largely due to its success in the field and its ability to meet current needs. Asymmetric-COMMS and the WeCAN have a beginning similar to BGIXS II, and initial indications are that these systems will be even more successful. It's hard to argue with results.

Finally, the bandwidth for Asymmetric-COMMS, while significantly greater than existing communications systems, is still relatively small by commercial standards. As such, it could easily be overloaded by transferring large amounts of data (mainly

graphics). Efforts must be made to keep the data lean and thought must be given to the type of data that is being transferred.[2]

## On The Air

To push forward with the submarine communications revolution, I have the following recommendations:

First: Develop an infrastructure to support Asymmetric-COMMS. This would involve outfitting select submarine Broadcast Control Authorities with Asymmetric-COMMS to SIPRNET gateways and identifying available satellite channels. Shore installations would be approximately $180K each, and low priority circuits, such as SUB OTCIXS, could be used for Asymmetric-COMMS. Additionally, work should continue on developing time-sharing and multiplexing schemes so that several submarines can share one channel.

Second: Equip all deploying submarines with Asymmetric-COMMS. This would phase in Asymmetric-COMMS over a two (or so) year period and would give the greatest return on investment.

Third: Implement and activate the WeCAN on a world-wide basis. The WeCAN is currently a dormant web site that gets activated for specific exercises. CTF-12 is planning to permanently activate the WeCAN in the Pacific, but more should be done. Each theater ASW force commander should activate and manage a WeCAN site permanently, and should set policy and control the web page design. Memorandums of understanding between the theater ASW commanders and the numbered fleet commanders should be signed that would allow use of the WeCAN by the battlegroups for area ASW.

## Conclusion

"[T]rue military revolutions have occurred only twice before in history, and there are strong reasons to believe that the third revolution—the one now beginning—will be the deepest of all"[3] The Submarine Force is now standing at the cusp of this revolution. The equipment is readily available, but that is only part of what is necessary to be successful. We also need to develop the

training, the tactics, and most importantly, the *thinking* that will enable us to capitalize on this opportunity, and we must have the courage to act *now*.■

NOTES

1. For example, some battlegroups have resorted to putting BGIXS II on their surface escorts to facilitate dissemination of the battlegroup's daily Air Tasking Order (ATO).

2. As an example, instead of sending graphics of tactical displays, one could send "kernel" data, which is a small file that has all of the model elements necessary for the machine to recreate the picture on the other end. In addition to keeping file sizes small, kernel data enables the user to go back in and manipulate the model; something that cannot be done with a static picture. Web pages on the Internet are starting to use a similar technique, called "XML", which is predicted to replace HTML in a few years. See XML and the Second-Generation Web, John Bosak and Tim Bray in *Scientific American*, vol 280 no 5, May 1999, pp. 89 - 93.

3. The current revolution in military affairs is being driven by the information revolution. (e.g., the Third Wave). Alvin and Heidi Toffler, *War and Anti-War*, Boston: Little Brown & Co., 1993, pp. 29 - 30.

**INACTIVATION**

**USS WILLIAM H. BATES (SSN 680)** will inactivate on 4 August 1999 at Submarine Base, Pearl Harbor, Hawaii after 26 years of service. The ceremony will commence at 1300 with a reception to follow at Lockwood Hall.

## NSL OUTSTANDING ACHIEVEMENT AWARD TO NROTC UNITS

*by CAPT George Graveson, USN(Ret.)*
*NSL Staff*

The Naval Submarine League (NSL) Outstanding Achievement Award is an annual award intended to promote the Navy's nuclear submarine community within the NROTC units. The award recognizes midshipmen and officer candidates with proven academic and leadership skills who have been selected for entry into the Navy's nuclear propulsion program as submarine officers. The award consists of a certificate, a letter of presentation, a one-year honorary membership in the NSL, and recipient acknowledgment in **THE SUBMARINE REVIEW**.

(1) Eligibility criteria. The student must:

- (a) Be a scholarship senior or a member of the enlisted Commissioning Program (ECP) and a selected nuclear submariner
- (b) Demonstrate superior academic aptitude
- (c) Exhibit a strong desire to pursue a career in submarine warfare
- (d) Demonstrate balanced qualities and aptitude for accession as a naval officer
- (e) Be a role model to inspire others to strive for nuclear submarine program selection.

The award is titled the

**FREDERICK B. WARDER AWARD**
for
**Outstanding Achievement**

It is named in honor of Rear Admiral Warder, a standout among the many World War II submarine heroes. He was dubbed **"Fearless Freddie"** by his own crew in SEAWOLF, out of respect and admiration, and as a byproduct of a particularly aggressive and innovative war patrol in the Western Pacific.

- Commanded SEAWOLF on 7 War Patrols
- Credited with sinking 8 Japanese ships (38,900 tons)
- Chosen to command second U.S. "Wolf Pack" which consisted of SNOOK, PARGO, and HARDER
- Commanded the Naval Submarine School
- Served as Commander of Submarine Forces Atlantic
- As a mid-grade officer, stood "toe-to-toe" with seniors to successfully defend a crew member wrongfully accused
- Described by Clay Blair as

  Courageous
  Prepossessing
  Salty Tongued
  A fighter who was worshiped by his crew
  One of the best of the Skippers who were fine, aggressive leaders

## 1999 AWARDS

This year, awards were given to forty NROTC Midshipmen and Officer Candidates. The names of the recipients and their respective colleges and universities are listed at the end of the article. Here are a few samples of the *thank you* letters we have received this year.

"... I want to thank you for the Frederick B. Warder Award for Outstanding Achievement. I am honored to have been selected as a recipient. Please extend my thanks to Commander George Fraser for taking time to make the presentation..." Midshipmen 1/C

"...It is with sincere thanks and appreciation that I sit down to write you this thank-you note. On behalf of myself and the Navy ROTC, I want to thank you for bestowing the award upon me, as well as sending a representative to give me the award personally. With sincere thanks..." Midshipman 1/C

"...I'd like to thank you for helping to make this year's President's Review a success. Your personal participation and the Naval Submarine League's continued commitment to the young men and women of our NROTC unit speaks highly of the dedica-

tion that's vital to the survival and growth of programs like ours. Rest assured, your gracious and unfailing support is greatly appreciated... We look forward to working with you again next year. In the meantime, please let all the members of your organization know how much their support means to all of us..." CAPT, USN, Commanding Officer

"...We are grateful for your contribution to our annual Awards Day Ceremony. Captain Earl L. DeWispelaere, USN(Ret.) presented the award on your organization's behalf. The ceremony would not have been possible without the dedicated support of organizations like yours. The Midshipmen, Officer Candidates... wish to thank you for recognizing their efforts and achievements over the past year..." CAPT, USN, Commanding Officer

"...Thank you for the NSL Outstanding Achievement Award for our Awards Ceremony on 22 April 1999. I presented the award on your behalf... Your support and interest in recognizing Midshipmen who perform in a superior manner is greatly appreciated..." CAPT, USN, Commanding Officer.

## 1999 NROTC AWARDS
**(Alphabetic by School)**

| School | Awardee |
|---|---|
| University of Arizona | Midn 1/c Andrew E. Liston |
| Auburn University | O/C Lashun Booth |
| Boston University | Midn 1/c David W. Guirguess |
| Carnegie Mellon University | Midn 1/c William R. Towcimak |
| Cornell University | Midn 1/c Andrew C. Omeara |
| Duke University | Midn 1/c Howard M. Goldstein |

| | |
|---|---|
| George Institute of Technology | Midn 1/c Andrew B. Platten |
| (Hampton University) Old Dominion University | O/C Dmitry Poisik |
| University of Idaho | O/C Jesse G. Hill |
| University of Illinois | Midn 1/c Mark C. Craven |
| Iowa State University | Midn 1/c Jake T. Wadsley |
| Jacksonville University | O/C Scott M. Cullen |
| Marquette University | Midn 1/c Eric D. Neider |
| Massachusetts Institute of Technology | Midn 1/c Roger S. Cortesi |
| University of Michigan | Midn 1/c Jed D. Christiansen |
| University of Missouri | Midn 1/c Samuel E. Young |
| Morehouse College | Midn 1/c Leon M. Williams |
| University of New Mexico | O/C Mackenzie J. Carter |
| North Carolina State University | Midn 1/c Kevin R. Creasman |
| North Carolina | Midn 1/c Joel D. Sgro |
| Northwestern University | Midn 1/c Chad M. Eslinger |
| University of Notre Dame | Midn 1/c Nicholas A. Pettite |
| The Ohio State University | Midn 1/c Matthew Keiser |
| University of Oklahoma | Midn 1/c James E. Mahoney |
| Oregon State University | O/C Michael K. Darby |
| University of Pennsylvania | Midn 1/c Nathan N. Sharbaugh |

| | |
|---|---|
| The Pennsylvania State University | Midn 1/c Kenneth P. Delage |
| Purdue University | Midn 1/c Timothy M. O'Kane |
| Rensselaer Polytechnic Institute | Midn 1/c Matthew J. DiGeronimo |
| Rice University | Midn 1/C David Weirich |
| University of South Carolina | Midn 1/c Scott D. Milner |
| University of Texas | O/C Patrick Neise |
| Texas A&M University | O/C John S. Adkisson |
| The Tulane University of Louisiana | Midn 1/c Leslie A. Martin |
| Vanderbilt University | Midn 1/c Charles A. Dreas |
| University of Virginia | Midn 1/c Robert K. Oswald |
| Virginia Military Institute | Midn 1/c Benjamin A. Chang |
| Virginia Polytechnic Institute & State University | Midn 1/c Joshua B. King |
| University of Washington | O/C Allen Rutledge |
| University of Wisconsin | Midn 1/c Cal R. Abel |

## THE SUBMARINE REVIEW

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

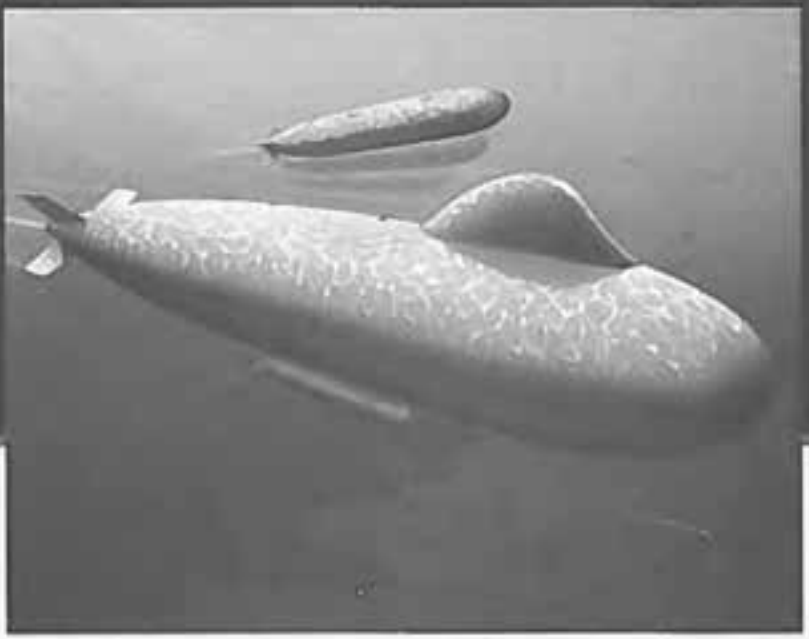
Articles for this publication will be accepted on any subject closely related to submarine matters. Their length should be a maximum of about 2500 words. The League prepares **REVIEW** copy for publication using Word Perfect. If possible to do so, accompaning a submission with a 3.5" diskette is of significant assistance in that process. The content of articles is of first importance in their selection for the **REVIEW**. Editing of articles for clarity may be necessary, since important ideas should be readily understood by the readers of the **REVIEW**.

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

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

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

# THE POTENT PEACEKEEPER.



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## U.S. NUCLEAR POLICY IN THE 21ST CENTURY

*by ADM Hank Chiles, USN(Ret.)*

In the April 99 issue of **THE SUBMARINE REVIEW**, Capt. Bill Norris commented on subject study pointing out areas about the report that bothered him. Several of his thoughts deserve further discussion:

He was concerned that the study members were, in the main, military officers, government officials and national laboratory employees (from only one laboratory). It was not obvious from the report, but in fact, personnel from all of the nuclear weapon laboratories were invited to participate. This was a lengthy study, and it's unfortunate that more of the personnel who initially started the project were unable to stay to completion. Participants also were from think tanks and included former officials. In general with a few exceptions, this was a middle-of the-road constituency without abolitionists and blatant *nuke em* hawks.

Bill commented that "the study gives mixed signals for the nuclear Tomahawk", that "non-strategic nuclear weapons are systems without an advocate" and the study seemed to focus on strategic weapons. He opined that the emphasis on strategic forces may be because the major operations input appeared to be STRATCOM. The study group did not envision itself as a cheerleader for nuclear weapons but tried to discern the proper role. It is certainly fair to note that the study gives mixed signals concerning nuclear Tomahawk and indeed all of the so-called theater nuclear systems. Especially, within the Operations Group there was a strong feeling that the distinction today between strategic and non-strategic nuclear weapons was a bogus concept. All nuclear weapons use by any thoughtful leader entails a decision that crosses an immense chasm; truly a strategic decision. The same warhead may be used by strategic or non-strategic platforms. Range can be considerable for so called non-strategic weapons. The real difference is that *strategic* systems in our inventory have been brought under the regime of arms control agreements; to date active stockpile *non-strategic* weapons have not. Further, absent political considerations and extant international agreements, there appears to be little reason for long term investment in so-called non-strategic weapons and the modifications to USAF fighter/attack aircraft to carry them. The delivery of nuclear weapons can be effectively executed by bombers ICBMs and SSBNs. This feeling is not universally shared.

Bill commented that "I would like to have had the concept that

new weapon development or modification of existing weapons be accepted and expected more strongly emphasized". The study noted (page 3-22) that it was not the purpose of the study to define the number or shape of future U.S. nuclear forces, and argued for strong operator input into the design of future weapons. The paper also stated as one of its operations conclusions that: "The United States should develop a nuclear warhead capable of attacking deeply buried or hardened underground facilities as well as an extremely accurate, relatively low-yield, low- altitude burst weapon for use against biological weapons facilities." (page 3-57). Preservation of the country's capability for design and production of nuclear weapons is a hallmark argument of this study. (page 1-41). I agree completely with Bill that we should not let the stockpile we have inherited become the requirement for the future.

Bill noted "that budget is ignored as a reality". Fiscal concerns were mentioned on 15 different pages in the first 3 chapters, and Bill properly highlights the importance of proper funding. It should be noted that without a coherent argument for why strategic systems are necessary it will be virtually impossible to successfully argue for the necessary budget. This paper sought to lay out the need for continued attention to nuclear weapons in the post-Cold-War world with viable programs and policies. The coherent argument of the Department of Energy for a well-planned Stockpile Stewardship Program has enabled DOE to stabilize the Defense Programs budget after a steep slide. The Department of Defense needs to learn from that lesson.

Bill notes that the "report points out, nuclear policy and planning is an area of expertise that we are not maintaining". It would be an overstatement to conclude that the authors of the report believe that current nuclear policy and planning over-all is not being maintained. It also would be a grave mistake for our potential adversaries to believe this area is being ignored or neglected today. It is fair to assert that the study participants were concerned about the future plans to ensure that sufficient personnel were prepared and that the Department was properly organized to focus on the right policy issues.

Bill Norris presents a thoughtful discussion that helps to clarify this study. Nuclear weapon policy and role in the contemporary U. S. military structure is a subject that increasingly is becoming a key responsibility of the Submarine Force as other parts of the Armed Forces focus on different principal missions. This dialogue is important and welcomed. ■

## ON SSN DESIGN

*by CDR Daniel Farson, USN*

Mr. Richard Boyle's April 1999 **SUBMARINE REVIEW** article "Attack Submarine Design: Let's Wake Up and Win", on submarine maneuverability, missed the mark so completely on most of the issues involved that I feel compelled to reply. Submarine maneuverability in the littoral and under ice environments is certainly ripe for discussion, but not necessarily for the reasons Mr. Boyle mentions.

Mr. Boyle asks, "Do we really want to skulk around in shallow littorals with a Virginia class SSN, an ungainly $2 billion, 7800 ton 377 foot long submarine?" Along the same lines a few paragraphs later the question is, "We need some large submarines to carry heavy payloads, but doesn't it make sense to have at least one other class of smaller, less sophisticated, highly maneuverable, and cheaper submarines for littoral missions?" He of course implies the answer to the first question is "No" and to the second "Yes". I think he has the answers very nearly reversed.

The sub we need to take to the littorals is one that will get the job done, and the majority of those littoral jobs are best accomplished by a sub capable of carrying a heavy payload. Delivering swimmers and carrying a few UUVs or UAVs, all the while equipped with a meaningful mix of torpedoes and missiles, may not be the forte of a "smaller, less sophisticated" submarine. That said, I agree totally with Mr. Boyle that submarine maneuverability in the littoral and under ice environment is of great concern. The definition of maneuverability apparent in Mr. Boyle's article, however, needs however, to be expanded a bit.

Defining maneuverability purely in terms of tactical diameter doesn't adequately address some of the issues arising from operating submarines in close proximity to the bottom, ice, possible mines, or other hazards. **We need to be able to precisely control our submarines at zero speed** to maximize capabilities in any environment that brings us in close proximity to hazards. A definition of maneuverability including precise control of depth, heading, pitch, and their rate of change is a lot more useful when looking at this area of submarine performance.

Reasons to expand our capability to operate at zero speed include:

- Greater stealth for intelligence collection, surveillance and reconnaissance. Speed through the water has always been an attribute that discriminates a target from trash in the water, and increased digital processing power in surface search radars makes motion ever more detectable. We might be able to combine ship control at zero speed with photonics mast technology to make a *photonics spar buoy* feasible. Imagine conducting I & W missions with own ship at safe depth, and the amount of mast exposed instantly controllable by reeling in or out as desired, similar to an SSBN's communications buoy.
- Better ability to operate UUVs and UAVs. Recovery of these vehicles in particular is enhanced by the submarine's ability to be dead in the water.
- Reduction of undesired mine sweeping cross section. A central fact of mine-hunting is that the location of the mines is to a greater or lesser extent unknown. (That's why you are hunting them.) This means that getting close enough to the estimated minefield position to deploy UUVs or UAVs is not risk-free. One really good way to cut ownship sweeprate to zero and maintain a position to control UUV ops is to proceed to the predetermined position using the utmost care, then stop and maintain a constant geographic position.
- Swimmer delivery. Without a drydeck shelter even a speed of one knot through the water significantly increases the work load for swimmers leaving or returning to the ship.

As for Mr. Boyle's statement that no amount of technology insertion can improve maneuverability, consider the fact that cruise ships eight hundred feet long routinely maneuver next to the pier with great precision using bow and stern thrusters. While hydrodynamic control surfaces are reliable, rugged, and have served us well throughout our history, it's time to look at supplemental means of ship control. Advances in variable speed electric motor technology may make pumps mounted in the forward and aft main ballast tanks feasible for precise control of heading, pitch, and depth with zero speed on the ship, plus increase maneuverability over conventional controls alone at slow speed.

The possibility of entirely replacing the bow planes with

thrusters should be considered. Bow planes are typically used only at low speeds, with depth control at moderate to high speeds handled by stern planes only. Bow planes do serve to mitigate the effects of stern planes control casualties, so use of split stern planes would be necessary if bow planes were eliminated.

Lastly, our current fleet of 688s are much more maneuverable, and the 688Is more under ice capable, than Mr. Boyle implies in his article. This is due to the improved placement of the trainable secondary propulsion motor compared to earlier fast attack submarines. Mounted just forward of the rudder, a 688's SPM provides an extremely small turning radius compared to the 637-class midships-mounted unit.

A lot of design effort in the past fifty years has been directed to expanding the top end of our speed envelope, both absolute top speed and maximum tactical speed. As we spend more and more time in the littoral areas, improving out ability at the *low* end of the speed envelope deserves some attention.

As *package delivery* littoral missions take on greater and greater significance to the Submarine Force, we can perhaps look to the package delivery professionals for some cues. Federal Express and United Parcel do not deliver using Chevy Corvettes. They use big trucks with short wheelbases. With a little effort we can give our submarines (including any Ohio class subs converted to SSN) the *short wheelbase* maneuverability needed to really improve our ability to operate safely in littoral waters.■

## PUFFS, THE MAGIC SONAR

*by CAPT Jack O'Connell, USN(Ret.)*

In the April issue of **THE SUBMARINE REVIEW**, Rear Admiral Holland offered some very useful ideas about uncertainty in submarine fire control solutions, and by extension—in the new age of information warfare. He mentions the seemingly overwhelming "need" for "one more leg" by the fire control party before they are ready to shoot. I had occasion to observe this first hand as Commander Submarine Division Forty One in Charleston during the period 1971-1972.

There were eight submarines and one submarine rescue vessel in the division at the time. Five of the boats were Guppy IIIs, equipped with the AN/BQG-4 sonar—Puffs. Despite the Puffs installation, it wasn't apparent from the review of the torpedo firing reports that the Guppy IIIs were doing much better at torpedo shooting than their non-Puffs equipped contemporaries in the division. That puzzled me. I had been Executive Officer in USS PICKEREL (SS-524) in 1962-1963, when we went through the Guppy III conversion, and Puffs was installed. We had learned how to use the new passive ranging sensor and found that it gave us many advantages in submarine vs. submarine combat.[1] Asking around, I found that none of the Guppy III COs had any doctrinal publications on the use of Puffs in the passive sonar approach and attack. I contacted the Operational Test and Evaluation Command up in Norfolk, and was able to obtain a copy of the OPEVAL report on Puffs and refresh my knowledge of the recommended tactics.

One of my first opportunities to observe the use, or rather the non-use, of Puffs information, came while embarked in REMORA while she and TIRU were returning in company from the Bahamas. The two boats alternated serving as ASW target and attacker as we transited back. I watched the REMORA CO, sonarmen, and fire control party detect the TIRU as she commenced snorkeling, determine initial true bearing, and take an approach course. So far

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[1] During the entire period I was shipmates with Puffs in PICKEREL we never had success in ranging SSNs passively.

so good. Then we commenced to jink and maneuver, as the fire control party strived to determine range to the target. It seemed that we were changing course every 3-5 minutes. We wound up twisting and turning, and on the fire control plot looking like the legendary bird, the Australian Side Hill Merrill, which according to the old story—when startled goes faster and faster, in circles of ever decreasing radius with ever increasing speed until it vanishes in a puff of smoke. The fire control party was never able to obtain useful range information from the Puffs sonar. We wound up simulating shooting at short range with a dubious *solution*.

After a quick critique of the approach by the CO while we served as a target for TIRU, I asked the CO if I could have the next run. He was somewhat surprised, and I quickly assured him I did not want the conn— merely wanted to dictate REMORA's maneuvers to him during his next run as attacker. He agreed, as any CO is wont to do when the DIVCOM suggests some thing that doesn't have the potential to sink the boat, but you could see the uncertainty.

The next run started out much the same as the REMORA's previous turn as attacker. Detection, followed by determination of direction of target motion. I then told the CO to take a 70 degree lead angle, make turns for 2/3 speed and, and—not do anything. You could see the palpable desire to maneuver flitting across the COs face and it was reflected in the faces of the fire control party as the leg proceeded. Sonar was having no trouble tracking the snorkeling target. Finally the Puffs sonar provided a range, then another, and another. Initially the ranges were bouncing around and it wasn't easy to determine target course and speed from the plot because you had no idea which ranges were good. The fire control party, and the CO, looked appropriately suspicious of my *tactics*, although not a word was said. Then, something strange happened as we continued on a steady course and speed. The ranges started to smooth out, and before long the fire control plot looked like a good ST radar approach when you didn't have to worry about the target detecting your periscope radar. We had target range, course and speed cold. We could have fired Mk 14-5 torpedoes for a hit, let alone using the Mk 37 acoustic torpedoes

which we carried for attacking submerged targets.[2]

Afterwards, as we reviewed the run, I pointed out something that I considered absolutely key. **We didn't need to determine target course and speed before firing.** We didn't need a *fire control solution.*[3] We only really needed to know that the target was inside 10,000 yards and closing. The Mk 37 torpedo would take care of the fire control solution all by itself. The important thing was to get a shot off early—before the target could shut down—just as soon as the attacker had good ranges, and the range didn't exceed the torpedo's reach. The key to getting the good ranges was to maintain a steady course and speed while maintaining a broad aspect and allow the Puffs computer time to integrate the information it was receiving.

When we returned to Charleston, I put out the information on recommended Puffs approach tactics to all the Guppy III COs. I also did something else, slightly underhanded. The torpedo shop in Orion used to issue exercise Mk 37 torpedoes with either six minute or ten minute batteries. As you might imagine, there were far more six minute batteries available than ten minute batteries. This exercise battery limitation worked to further constrain the COs to focus on short range solutions, since they knew that they could only fire at short ranges during exercise firings if they were to get a hit. In order to eliminate that bias, I told the Weapons Officer in Orion that I didn't care how he did it. but that from now on SUBDIV 41 boats would only take exercise Mk 37 torpedoes equipped with ten minute batteries to sea to shoot. With these two measures, the Guppy IIIs of the division were able to increase the firing ranges of their Mk 37 exercise torpedoes by 100 percent, and to increase their hit percentages significantly.■

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[2] During this period the Mk 48 torpedo was undergoing its operational test and evaluation by 637s of SUBDIV 42.

[3] This is essentially the same point that Rear Admiral Holland makes in his article (page 50).

## DEDICATION ADDRESS
## by RADM Robert R. Fountain, USN(Ret.)
## of the TMC(SS) Walter W. Bishop, USN
## Bachelor Enlisted Quarters

*U.S. Naval Submarine Base, Groton, CT*
*5 May 1999*

Theresa, John, Mary Etta, Michael, Secretary Pirie, Admiral Giambastiani, Admiral Carr, distinguished guests, ladies and gentlemen.

This rainy May morning, in submarine weather, we gather to honor a man, a real man, his ship, his Navy and his country. In honoring the memory of Chief Torpedoman (Submarines) Walter W. Bishop, U.S. Navy, by dedicating this enlisted quarters in his name, we honor as well all those he loved. In reading his name upon the portals of this building, may generations of young sailors be inspired by his sense of duty, by devotion to this Submarine Force, and by the love of country he exemplified.

Wally Bishop represented the backbone of our Navy, the myriad numbers of young men and women from the small towns of America who flock to the colors inspired by patriotism and seeking adventure, opportunity, and advancement. These young people, now as then, are molded by tradition, challenged by rigid training, shaped by a gentle discipline and forged into the American sailor, capable of feats beyond their dreams, capable even of heroism when called upon.

Walter William Bishop was born June 7th, 1930 in Pittsfield, New Hampshire. A high school athlete, with ten letters in baseball, basketball and track, he graduated from Pittsfield High School in June 1948 and promptly entered the Navy. He completed Submarine School in December 1948 and began his submarine career in the diesel powered fleet boat CORPORAL, where he completed his submarine qualification. Subsequently, he served in the commissioning crews of the new fast attack diesel submarine WAHOO and our fifth new SSN, USS SARGO.

Then-Torpedoman First Class Bishop was the first member of SCORPION's commissioning crew to report, in September 1959, returning from the West Coast to Groton with his young and growing family. SCORPION was then still on the building ways at Electric Boat, where she was launched in December 1959 a

commissioned in late July 1960.

USS SCORPION (SSN 589) was a member of the Skipjack class of nuclear powered attack submarines, the first class to combine the new highly streamlined Albacore hull form with the powerful S5W nuclear reactor plant. The Skipjack's were the world's fastest submarines at the time, and revolutionary fighting ships. SCORPION in her day held both the transatlantic crossing record and the submerged endurance record.

I reported aboard SCORPION in the spring of 1961 at the end of her PSA, and was assigned immediately as her weapons officer. It was here that I met Wally Bishop, and began the long period of our service together. Torpedoman First Class Bishop was in charge of SCORPION's torpedo room, including the crew's berthing compartment above and the ship's main deck as Topside Petty Officer. When I say in charge, I mean in-charge. Not a person on board had the least doubt—not the torpedo gang, not the deck seamen, not those bunked in the berthing compartment, not the chief petty officers in the Goat Locker below, not certainly the weapons officer.

I quickly reached an understanding. While I had served previously as weapons officer in a diesel boat, Bishop was a professional. He knew his job, and his pride and quiet confidence were evident. Everyone, officer and crewman alike, treated him with utmost respect. He was not bombastic. In fact he led by taciturn New England example, but his quiet disapproval flicked like a lash that none wished to taste a second time.

In those days a torpedoman was truly a technician. The torpedo was far from a so-called *wooden round* that merely needed periodic dusting. The variety of torpedoes in the room required detailed knowledge and a craftsman's touch. Steam powered Mk 14s, hydrogen peroxide powered Mk 16s, old electric powered Mk 27s, the then-new wire guided Mk 37s, ASTOR torpedoes with nuclear warheads, SUBROC launched ASW nuclear depth bombs. Bishop was a master of his trade.

I continued as weapons officer of SCORPION for over two years, even as I picked up additional responsibilities—supply officer, electrical officer, main propulsion assistant, diving officer, and so on. Bishop and my professional regard and mutual respect continued to deepen and grow. The ship steamed hard. In July 1962 Bishop made the Navy-wide competitive advancement list for

chief torpedoman, but had not yet been advanced. Our captain, Commander Bob Kaufman (later Vice Admiral), and our exec, Lieutenant Commander Carl Trost (later CNO) were faced with selection of a new chief of the boat. Despite the presence of several fine CPOs, including two senior chiefs, it was evident Petty Officer Bishop embodied the highest leadership qualities of any man on board, so the captain appointed Petty Officer First Class Bishop as chief of the boat and obtained approval from SUBLANT to *frock* him as chief until his number came up on the official promotion list!

Chief Bishop moved in the chief's quarters, selected the bunk he wanted, had a closed door meeting with the chiefs and that was that. The ship deployed, returned with a Navy Unit Commendation and we won the SUBLANT Battle Efficiency "E" and the Award for Excellence in Fire Control, Torpedo Firing and Tactics that year.

I left the ship in the summer of 1963 to put a new fleet ballistic missile submarine in commission as engineer, but returned to SCORPION in the fall of 1965 as executive officer. Chief Bishop remained as chief of the boat, and we quickly resumed the easy working relationship we had enjoyed in the years before. He was my right hand man, the person I consulted always in matters affecting the crew, the man I turned to invariably whenever problems arose. The ship continued to operate hard, and won SUBLANT Battle Efficiency "E"s again for fiscal years 1965 and 1966.

I left SCORPION again early in January of 1968 for duty ashore, but I think it fair to say, that officers came and went, and crew members, too, but the soul of SCORPION was embodied in Chief Torpedoman Walter Bishop, chief of the boat, as fine a man and petty officer as ever it was my privilege with whom to serve.

For all those years together Chief Bishop and I were near neighbors. Our families lived in close proximity out Little Creek Road in Norfolk. From time to time I gave him a lift home when we were working late. He was a devoted family man, and as he spoke to me of his family the pride fairly glowed. He loved Theresa and his children, and would today be immensely proud of their accomplishments as adults. As the chief of the boat's wife, Theresa was the stalwart rallying point for the enlisted wives during long deployments, as she has continued to be the long years

since.

SCORPION deployed to the Mediterranean in February 1968, and continued to perform at her accustomed high level, despite an almost complete turnover in her wardroom and of many of her crew. Chief Bishop remained her one true constant. SCORPION disappeared in late May 1968 while on return transit to Norfolk. Months later her wreckage was found on the bottom, southwest of the Azores Islands in the deep Atlantic. While evidence points to an operational accident, we shall never know the precise cause of her loss. However it occurred, rest assured that Chief Torpedoman Walter Bishop led the efforts to save her until the end.

May the young sailors who gaze upon this building today, and dwell here in future years, reflect upon the unsurpassed example of leadership and professionalism bequeathed to them by its namesake. I can wish them, and through them the Submarine Force and our Navy, nothing more than that they rise to this challenge, and strive to equal, if not surpass, the accomplishments of Chief Wally Bishop, Chief of the Boat of USS SCORPION, Chief Torpedoman, leader, shipmate, friend, husband, father, and man. A **real** man.

Thank you.■

## PEOPLE: OUR MOST IMPORTANT ASSET

*by CAPT Paul J. Ryan, USN*

*Captain Ryan commanded USS PHILADELPHIA and USS L.Y. SPEAR.*

I recently had the pleasure of commissioning Ensign Bill Donnell, a nuclear Machinist Mate who had served with me ten years ago when I commanded USS PHILADELPHIA. I chose this opportunity to talk about people and leadership, passing on to the next generation some very basic leadership insights that I've developed over the last twenty-five years, and that we so often tend to forget.

- **Get to know your people.** Take time to talk to them about their past, about what they're doing now, and about their plans for the future. Each sailor and officer is a unique individual and should be treated as such. Many times leaders mouth the phrase "people are our most important asset," without taking action commensurate with that belief. People really are the most important asset we have in the Navy, and we need to give that concept more than just lip-service.
- **Encourage your people to improve themselves** through additional qualifications and off-duty education. Most people join the military for skill training or education. Encourage them to get it and periodically provide relevant information. Let your people know about in-service college programs and special programs they may be eligible for, like the Naval Academy Prep School, BOOST, etc. The more senior you are, the greater access you have to information resources. Pass the information to those who might be able to use it.
- **Take time to recognize superior performance** and pay attention to those guys and gals who work hard in supporting roles: Repair Parts Petty Officers, cooks, midnight bakers, etc. There are many ways to recognize people: letters of commendation, Sailor of the Quarter/Year, letters to spouses and parents, special liberty, and finally, personal awards. Awards are cheap. Unlike industry, we can't

reward good performance with cash bonuses. The typical ribbon costs about 59 cents, but it's worth its weight in gold to the person who receives it. Leaders just need to take the time to write the letter of commendation or fill out the award form.

- **Be sensitive to the needs of your subordinates** and take care of them. One wise old Prospective Commanding Officer instructor once told his class: "Remember, the Captain's the only guy on board who gets excited about going to sea." Translate that down to your department, division or work center: everybody's not as excited about their jobs as you are. Make sure you recognize their individual needs and give your sailors, and officers, periodic rope-yarn Wednesdays, occasional long weekends, compensatory time off after exams, etc. It's a small way of saying thanks for your hard work.
- **Lead from the deckplates** or use an *out and about* leadership style. In the computer age there's an increasing tendency to communicate via e-mail. E-mail has its place, but a leader needs to be seen and heard to lead effectively. Get out of your office or stateroom, walk around your spaces, and talk to your assigned personnel. It's easy on a submarine, but harder on a large ship like a submarine tender. You need to do it anyhow and you'll be amazed at what you learn sometimes.
- Practice what you preach. Your subordinates will watch what you do and how you behave. There should only be one standard, and everyone should adhere to it. Keep your credibility intact.

In summary, people really are the most important asset we have in our Navy. As we become more senior, whether in the officer or enlisted ranks, we'll have an even greater impact on the sailors and officers we come into contact with. Take good care of them, they are the Navy's future.■

## CROSSING THE CANAL IN A RUBBER RAFT

*by Donald Boberick*

*Balboa, Canal Zone, June 1946.* USS DIODON (SS 349) left the Submarine Base at Groton, Connecticut in May 1946 under the command of Lieutenant Commander J.M. (Jim) Hingson, USN. Ship's orders were to conduct a shakedown cruise to include visits to several ports along the eastern coast of South America and then proceed, via the Panama Canal, to San Diego, California and report for duty to COMSUBPAC in Squadron 7.

After visiting the naval facilities at Port of Spain in Trinidad, the cities of Rio de Janeiro, and Sao Palo in Brazil, DIODON entered the Panama Canal at the Colon side.

During its traverse of Gatun Lake, DIODON made a highspeed surface run attaining a surface speed of 20.5 knots. Going through the locks those of us in the deck force (I was a Seaman First Class, Radio Striker) marveled at the manner in which the Panamanian stevedores tossed their heaving lines in a figure eight motion. My attempt to emulate their technique left us with one less heaving line. Sometime during daylight hours, we reached the Pacific side and berthed at the Rodman Naval Station across the canal from the docks at Balboa. We remained in Panama for three or four days, before proceeding into the Pacific Ocean and north to San Diego. The following describes one of the memorable occurrences while we were in the Canal Zone.

On the first day of liberty, several of the crew took a launch over to Balboa. A shipmate and I walked into Panama City, took a taxi to a small airport nearby and rented a Piper J3 Cub. We flew around the area just looking at the scenery around Panama City. On our way back to Balboa that afternoon to return to the boat, we observed that a large passenger transport had docked at Balboa. When we approached the pier where the transport was berthed we saw that the entrance onto the pier was blocked and military guards (U.S. Marines as I recall) were preventing any sailors from going onto the pier. When we inquired, we were told that the ship was British and that it was enroute to Australia with a cargo of English wives of Australian service men whom they had married in England. We could see a great many of the women on deck and they were joyously touting or teasing the sailors on the dock to try and board the ship, which they were prevented from

doing by the Marine guards. The idea of getting onto that ship with its cargo of young women was enticing to several of us from DIODON.

When we returned to the boat it was getting dark and we could see the lights of the British transport across the canal. While we had been away on liberty, work crews had been making paint repairs to the hull and one or more black rubber rafts were in the water tied to the boat. Three of us concocted a scheme of getting onto the British transport by rowing one of the rubber rafts across the canal and approaching the ship from the seaward side. Someone had managed to return from liberty with a bottle of bourbon and we were not entirely sober at the time. We gathered up three oars and set off as planned, not realizing how wide the canal really was at that location.

Before we had reached mid canal we were approached by what appeared to be a Captain's gig or an Admiral's barge—we were certain the vessel was coming to corral us and we were quite scared. It turned out to be a gig with only the crew aboard. Instead of being taken into custody for being where we were, we were offered a tow over to the public pier at Balboa.

The next thing we knew we were bow-high and planing across the water in that raft at a speed it was never designed to travel. As we entered the dockside area and while we were still fairly close to that outboard side of that transport, we shouted thanks to the gig crew and let go of the towline. The raft came to a stop so suddenly that it almost upended. Thereafter we slowly paddled the raft over towards the transport.

We made a first attempt to get aboard via a loading hatch that was open in the side of the hull. We were thwarted by over anxious ladies who had spotted us in the water and were beckoning us to go this way or that to get aboard. Fearing detection and probable incarceration, we slipped the raft behind the stern of the transport and into the shadows of the pier pilings. We waiting for close to a half hour, and certain that we had been forgotten, slowly rowed the raft back around the stern and alongside the transport again. This time we managed to reach the open hatch undetected.

Once beneath the hatch one of my shipmates stood and was able to get a hand on a line that was hanging from a davit above hatch. He hauled himself up and climbed aboard. We had not remained completely unseen, however. Before either of us who were still in

the raft could manage a second ingression some of the women were leaning over the railings and encouraging our efforts. This second detection was accompanied this time by what was apparently ship's crew members turning flood lights on us from above. One light caught and then another. We were so surprised and frightened we yelled at our shipmate standing in the hatchway to jump back aboard. The trip was four or five feet and when he hit the raft it nearly closed like a flowered petal at sunset. That scared us off permanently and we headed back toward the other side of the canal as rapidly as we could row the raft with two oars and one steering.

In our escape toward home we failed to see a tugboat bearing down upon us from the directions of the locks. Suddenly we heard the bow wake and everything went dark. We narrowly escaped being run over by that tug. We finally managed to get back to the other side, albeit some distance down canal as the tide was going out. After paddling several hundred yards up canal we got safely back to the boat—very sober, a little scared and hopefully wiser for the experience. We decided later we must have been the first U.S. sailors to ever cross the Panama Canal in a rubber raft.■

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## LETTERS

### *ON CRIMSON TIDE*

Captain Mel Lyman's interesting article on SSBN weapons C3, "Crimson Tide-They Got It All Wrong" reflects a generally misunderstood facet of the beginning of the Permissive Action Link, PAL, on nuclear weapons. PAL's began as *unlock devices* on nuclear weapons carried on tactical aircraft in Europe in the '50s. The weapons were controlled by the United States but were to be delivered by aircraft of NATO allies. There were times the aircraft were in a tactically ready status, armed with the weapons.

To address the question of control by the United States, unlock devices were installed on the weapon. The aircraft crew had to get a coded number from an American unit stationed on the base as custodians, enter that code into a device on the plane which would allow them to release the weapon and permit the weapon to arm. The code was held centrally and provided to the American unit after authorization to use the weapons had been granted. Picture a young Air Force Captain standing along the runway apron, holding a large blackboard with several numbers written on it. Crude but effective. This solution satisfied both countries involved in delivery and answered the concerns raised by the Turks, for instance, about arming Greek aircraft.

Sometime after this circumstance in the late '50s and early '60s, the Air Force, planning the C3 for the Minuteman missile, reduced the Command Capsule Crews from four men as had been in Titan launch centers to two man teams. Among the techniques to provide an increased level of surety against an unauthorized launch, the Air Force decided to install *Permissive Action Links* in these new weapons. The two man silo crew needed an outside input in order to arm and launch the weapons. As I understood the reasoning some years after the fact, this decision was made by the Strategic Air Command/Air Force without consultation or pressure by outside agencies or interest groups. I suspect that the surety and safety personnel at the national laboratories may have been more than passive observers in this effort and of course the scientific personnel at the laboratories were always happy to have a new challenge or mission.

It was significantly later, late '70s, that the issue of inadvertent

or unauthorized launch of Navy controlled weapons was generated—first by advocates of land based missiles and then later by academics who generally found the control of nuclear weapons wanting. It is instructive to recognize the most eloquent spokesmen of this latter group had their practical experience in the Air Force deployments.

The Navy's position that too many people were required to make an authorized or inadvertent launch possible was never accepted by people who believe that mechanical interlocks are superior to personal ones. Even after the installation of the devices outlined by Captain Lyman, there remain people who fear inadvertent or unauthorized launches. These will undoubtedly continue to agitate for further inhibitors, but their real aim is nuclear disarmament. While that goal is a laudable one, it is political not military and ought to be approached as such rather than to advocate constraints which are at once costly and secondly downplay the importance of the personnel selection, training and procedures associated with nuclear weapons.

***Jerry Holland***

*Admiral Holland served as Director of Theater and Strategic Nuclear Warfare on the OPNAV Staff in 1962-63.*

## A THANK YOU TO THE LEAGUE

May 17, 1999

Please accept my sincere appreciation for the outstanding support that the Submarine League gave during the recent Sailor of the Year season. The League's contribution went a long way in making this year's week-long event one of the most memorable for our submarine sailors. I can't tell you how many positive comments I received from the nominees and their spouses about how much they appreciated the Submarine League's support and what it personally meant to them.

Again, thank you for having an impact in our enlisted submarine sailors' lives.

*Sincerely yours,*
***Charles J. Dreer***
*ETCM(SS/SW), USN*
*COMSUBLANT*
*Force Master Chief*

*Editor's Note: The NSL Board of Directors, at their 3 June meeting, approved an annual expenditure of $4,000 for "Submarine Force" ballcaps and T-shirts to support two dedicated boot camp submarine divisions at Recruit Training Command.*

## ASW IN LITTORAL WATERS

*See: Lieutenant John Vlattas, "Shifting From Blue to Brown: Pursuing the Diesel Submarine Into the Littoral," The Submarine Review, April 1999, pp. 90-96.*

Lieutenant Vlattas has sounded a wake-up call in the littorals. We must pay attention.

Points Made

1. The diesel submarine will provide low target strength, smaller size to ping on and consequently lower return. When in motion it will have a lower electronic signature, minimal cavitation and produce little Doppler.

Obverse:

A large SSN (we don't have any small ones) will provide high target strength, larger size and higher returns. (SHKVAL, a submarine-launched rocket torpedo available on the open market today, could be fired from a bottomed diesel and would come screaming toward us at 200 knots.)

2. The shallows will produce high fast-contact rates due to higher ambient noise, ray path bending and reflections, and bottom debris. The shallow water zones closest to shore will be areas where fresh water from estuaries mix with the ocean water creating unpredictable layers with gradients not seen in the oceans.

Reinforcement of Argument:

Some question whether our active or forthcoming SSNs are capable of operating submerged in fresh water.

3. The nuclear submarine is from four to ten times larger than its conventional counterpart. Design of the nuclear subma-

rine also prevents it from being as maneuverable in shallow water as the diesel and makes it unable to perform such tactics as bottoming.

Reinforcement of Argument:

The length to diameter (L/D) ratios of front line and forthcoming SSNs are too high to provide the agility required in littoral waters.

I agree with the proposal to procure diesel submarines for SSN training in littoral waters.

It is also important, in my view, to re-examine SSN design concept and to develop smaller, highly maneuverable SSNs.

*Dick Boyle*

## REQUEST FOR INFORMATION

My name is Gary Coombe and I served in the Royal Australian Navy between 1966 and 1987, and in submarines from 1972. I am currently writing a fictional book about a U.S. Navy submarine sailor based at Fremantle, Western Australia during World War II. The book is all but complete with all the action scenes reconstructed from numerous publications but I need some information to *flesh out* the main characters. I would greatly appreciate any anecdotes, stories, yarns, and jokes of the era, along with social information pertaining to where you went, what did (within reason), how you got there, etc. I have already received some data from veterans living here in Western Australia but would welcome more.

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