THE SUBMARINE REVIEW

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OF
THE NAVAL SUBMARINE LEAGUE

From the President

The Holiday season is past, but I still want to wish all Submarine League members, "good health and success in this new year of 1985."

The Submarine Review has increasingly provided a sound reference base for supplying information needed to educate the public on the value of today's submarine force. To augment the League's programs for informing the public on vital submarine issues, in addition to the Submarine Review's material, RADM Paul Tomb, USN(Ret.) is heading up a team to get out a Fact Book by the spring of 1985 and Dori Williams' group is preparing a Speaker's Package of submarine educational films and 35 mm slide presentations for early check-out. Both efforts should be well underway before our next Annual Symposium in June.

However, even more important than the Submarine Review's information function -- for providing material for speakers and developers of submarine papers as well as spreading an interest in submarines to the civilian community -- is its value to the submarine community as an organ of discussion for advancing the professional expertise of submariners in their development of the art of submarining. Gratifyingly, we are seeing a growing recognition within the submarine community that the medium of the Submarine Review is a valuable aid for dynamically increasing the quality and effectiveness of an already highly regarded profession -- one faced with the steadily increasing threat of a potential enemy which places a major reliance on submarines.

The Annual Symposium and Business Meeting are scheduled for 19-20 June, 1985 at the new Radisson Mark Plaza Hotel and Convention Center in Alexandria, Va. A one-half day classified briefing session is scheduled on the 19th with the

all-day Symposium on the 20th. It is hoped that out-of-towners will stay at the Radisson Mark to better insure the success of our social functions during that period. So start planning for these events.

Finally, the League has added 832 new members to the roster in 1984 -- which puts us well past our goal set two years ago of 1984 members in 1984.

Chuck

From the Editor

A nationally prominent person who should be authoritative about this subject, said that if the U.S. went to war against the Soviets that within a few days the U.S. would totally destroy the Soviet "fleet". Inasmuch as Admiral Gorshkov, Head of the Soviet Navy, clearly states in his book The Sea Power of the State, as well as in other of his writings, that his "fleet" is composed of submarines and land based aircraft, it is difficult to see how this sort of "fleet" can be destroyed in the first few days of a war.

The Admiral's ships-of-the-line -- in the Mahan sense -- for gaining decisive victory against an enemy's "fleet" are his nuclear submarines. He sees a destruction of the enemy's battle fleets (U.S. carrier battle groups) as coming from a massive, concentrated "first salvo" attack with antiship missiles from great standoff ranges, delivered by submarines and long range aircraft, then a follow-up with torpedoes against the disorganized crippled (U.S.) fleet.

Perhaps the optimistic statement regarding destruction of the Soviets' entire "fleet" was based on the theoretical longevity of survival of the Soviets' surface warships. This would

mistakenly identify the Soviets' "fleet" as their surface ships which for the most part (even the big warships) are identified by the Soviets as being antisubmarine ships. They are not considered to be offensive "fleet" units for carrying out strikes against enemy battle groups (U.S. fleets), but rather defensive, protective ASW forces.

It should be further noted that these identified "antisubmarine ships" of the Soviets have as a primary mission, the protection of Soviet SSBNs. In a sense, and as described by Admiral Gorshkov, the Soviet SSBNs represent a "fleet-in-being" during a major war which can favorably influence the outcome of the war. He sees his surviving force of SSBNs, operating in their bastions and being protected by much of his surface fleet as a political blackmailing force which can cause a termination of the war. Soviet SSBNs are not a "fleet" to challenge the U.S. fleet at sea, but rather are a military force to project power against "the shore," and hence influence a war through the threat they pose to the homeland of the enemy.

The implications of the asymmetry between battle "fleets" are difficult to grasp and it is just as difficult to assess how decisive victory can possibly be gained by either "fleet" while this asymmetry exists. The OKEAN exercises in '70 and '75 and a recent very large scale spring exercise in the Atlantic and the Pacific indicate that the Soviets have been trying to iron out the complex coordination problems of a global attack against U.S. battle groups, wherever, in the opening moments of a big war. Moreover, there have been indications that the Soviets might use tactical nuclear weapons in fighting fleet battles -- and this makes the asymmetry of fleet capabilities even more difficult to assess because submarines and land based aircraft seem less affected by the effects of nuclear bursts.

The Soviet strategy may seem like an all or nothing one -- quick victory, or Soviet forces countered to the extent that the "first salvo" was blunted and the attacking forces dispersed. Yet mopping up on land based aircraft and nuclear submarines, even if they fail, could scarcely be in a matter of days -- unless it is optimistically assumed that the long range aircraft retrace their steps back to the bases they took off from and an alerted enemy's anti-air efforts then prove effective, while the Soviet submarines would hasten back to port to get reloads. Neither seems likely.

Is it important to recognize how the Soviets intend to fight their fleet-against-fleet battles, to quickly attain a decisive victory? It is, to submariners upon whom the major job of blunting this strategy apparently rests and who should then recognize the possibility of a protracted war ensuing because of their efforts. The reduction of the enemy's fleet of submarines, whether attack submarines or SSBNs, over an extended period of time places an increased requirement on weapon stocks and calls for the means to get more submarines into operation rapidly. Admiral Ike Kidd in a recent symposium suggests that the submarine force should initiate planning for a war-produced single purpose type of ASW submarine which could be built rapidly within the wartime limitations of critical materials and shipyard manpower. Dick Laning, in his article in this issue, Rapid Victory at Sea, however, shows the danger in accepting the inevitability of a long war. He thus calls for more effort to stockpile weapons before a war occurs and increase numbers of submarines over present levels. Both Kidd and Laning seem to feel that a war with the Soviets would start indecisively and hence a long war would be probable, but that measures taken now can head the U.S. towards victory at sea in a short enough period of time so that "nations of millions

of people" won't have sufficient time to adapt to the enemy threat and mutate the war into an exhausting one of unpredictable outcome.

C^3 AND THE SUBMARINE AS A SYSTEM OF FORCE

Today's command and control process extends beyond human sight and hearing; its reach is global and into space. Present command and control functions enable American and Soviet Union political leaders and military commanders to deal on a near-real-time basis with critical activities worldwide. The Soviet OKEAN military ocean exercises support this view.

Electronic technologies continue to enhance weapon performance by furnishing improved guidance and terminal homing systems. Use of electronic countermeasures in missiles is becoming standard.

Because weapons are more lethal and application of various degrees of force is now a matter of political responsibility, command and control systems are adapted to augment the ability of political leadership participation in military operations. As part of this mechanism of political control, command and control systems for "crisis management" are in place or will be soon. The Soviet-American HOTLINE System is an example.

Command and control systems depend more and more on satellites. But soon, military operations in space will expand beyond space shuttles, satellites and anti-satellite weapons. Military space operations will involve space-embedded man-operated command and control and communications (C^3) and weapons systems. Thus , space C^3 will add a new feature to existing war scenarios. How outer space and the inner space of submarines will be linked needs great thought and balanced discussion..

The most significant breakthrough in command and control is that electronic computer technologies have advanced sufficiently in the past few years to permit replacement of humans, in certain command and control functions, with machines in the C^3 loop. Kenneth McVicar, of the MITRE Corporation, notes in this regard that: "The future promises automated stand-alone expert systems that will generate decisions based on rules of reasoning that combine information from many sources. They will make unmanned decision-making feasible more often, first within narrow limits, and later, perhaps, more widely."

The C^3I Process

A better understanding of "what is command and control?" may be found by expanding the descriptor C^3 to C^3I, where the added I is "intelligence." Then, the C^3I process is best understood by viewing the echelons of command which deal with an environment into which a weapon is to be placed. An example is a submarine missile attack on a surface warship. (The concept for this is initiated in this issue's DISCUSSIONS.)

In a single echelon (a submarine commander using organic targetting information) the concept involves two major functions: Command Support Function and Command Function. In the former are included sensing the environment (enemy and physical conditions), processing, classifying and evaluating.

Overlapping of the two major functions occurs during the evaluating stepping subfunction after which "command" passes through doctrine, decision, acting, monitoring and feedback.

One can relate most of the process to machine and human subfunctions; i.e. long range passive

acoustic detection and tracking, processing, classifying and evaluating and "command" (commanding officer, fire control team, firing team, etc.). Monitoring and feedback follow with weapon launch.

This simplistic concept becomes increasingly complicated and uncertain the further the firing range, and the greater the need for identifying and localizing the target with external sensors.

But, the command and control process is usually not a single echelon operation. Military systems for the most part depend upon an hierarchical command structure to project force. It does not matter whether the force is a MK 48 torpedo or a cruise missile. Fortunately, the command structure for controlling submarine operations, which are for the most part independent, is a relatively simple one. In the American submarine Navy, the line between the senior operational submarine commander is directly to his tactical or strategic submarines. The senior submarine operating command may have interposed between himself and his tactical submarine another shore-based commander, as in Japan. Yet, it is questionable whether this intermediary would do very much once conflict began.

Regardless of the hierarchical structure, what normally takes place once crisis or conflict sets in is that senior commanders and political leaders quickly skip over echelons. This is because hierarchical commands tend to slow decisions in the fast-paced world in which we live. With modern weaponry and C^3 capabilities, political leaders and military commanders in capitols eschew delays in handling military problems. Any nice schematic of command and control relationships then becomes a confusing milieu -- one difficult to understand in actual action.

Presently, C^3I is not adequate in most military activities because the communications, the intelligence, the computer, and the weapon communities view each other with suspicion and sometimes distrust. Part of the problem is money and part of the problem is lack of understanding.

Systems of Force

The purpose of the command and control process is to direct the application of force against an enemy to destroy it or to make its potential in application so certain and effective (deterrence) that the enemy will not take aggressive actions.

If one integrates weapons, the men who use them, their platforms, and C^3 processes that make the application of force credible, then the most efficient form of combat or deterrence is achieved. This necessary integration might be termed a "system of force."

A system of force, moreover, may be conventional or unconventional. Within such broad categories it should be further subdivided into tactical or strategic, the latter meaning "strategic nuclear weapons."

Today and Tomorrow

If one looks at today's systems of force, it becomes evident that no weapon can be successfully employed without an effective C^3I system. As weaponry advances technologically, new concepts for their deployment tend to overlook the parallel efforts required in supporting C^3I.

Strategic weapon systems have not really advanced in this country beyond technology known in the late 1960's. While the Trident missile's range, for example, is an improvement over that of

Poseidon by 60%, and though it is an excellent new nuclear weapon, unfortunately, the C^3I system to support Trident uses techniques which were established in the early 1970's.

On the other hand, tactical weaponry has had some very remarkable advances -- the most remarkable is possibly the return to improved cruise missiles.

The impetus for new tactical weapons -- Vietnam, Middle East conflicts, and other episodes in Africa and Latin America -- has forced simultaneously new C^3I requirements.

The recent Israeli operations against the Syrians in the Bekaa Valley represent an outstanding example of a highly proficient C^3I system. The Israeli ability to deploy efficient command and control systems, countermeasures and weapons against the Syrians (for the most part Soviet supported) destroyed large numbers of the Syrian's weapons systems with little loss of Israeli strike forces.

The sinking of the Argentine cruiser Belgrano by the British submarine, Conqueror, during the Falklands battle was largely the result of coupling nuclear propulsion and the use of overhead sensors, excellent communications and excellent intelligence, plus sound evaluation and decision-making. The sinking of the British destroyer HMS Sheffield, on the other hand, by the Argentine air launched Exocet missile, probably could have been avoided if the British forces in the Falklands had been provided modern, balanced C^3I and adequate electronic countermeasures systems.

The American tactical submarine has shown some successful innovation in its weapons (Subroc, MK 48 torpedo) and its C^3I systems (Transit, Navstar, Fleet SatCom, VLF, ECM). There is some

concern, however, that recent Soviet submarine developments in platforms, weapons and C^3I (ELF, ECM, satellites, etc.) along with their cross-service operations might possibly be somewhat better.

Near Term Challenges

As pointed out earlier, new tactical weapons systems are capable of operating at great ranges. Some long-range missiles are now dependent upon over-the-horizon (OTH) radars, overhead tracking systems and highly integrated intelligence systems. Soon, 1,000-mile cruise missiles will stress even today's limited C^3 capabilities.

The command and control capabilities to meet the essential data needs of such future cruise weapons are on the margin of technological doubt at this time. While it is true that missile guidance techniques permit the launching of OTH weapons, these weapons simply are not smart enough to go it alone. Moreover, the demands of IFF and political intervention for dealing with OTH targets create C^3I uncertainties. The C^3I concepts to deal with such factors are not yet fully comprehended.

Over the past eight years, considerable study and effort has been involved with the C^3I necessary to deal with Cruise Missiles. One of the difficulties in structuring C^3I systems is in ascertaining the various concepts to be employed. For instance, is the weapon to be used as a precise attriting force, a massive retaliatory force, a supplementing force, a political bargaining chip or all or part of these forces?

To meet such challenges in the environment of Soviet countermeasures against U.S. C^3I systems, in the next decade, will require major technological developments and a highly sophisticated concept of operations backed with

adequate C^3I capabilities. Significant opportunities in digital computer technology exist to help overcome C^3I limitations. Yet, requirements and solutions appear to need further thought.

At the same time, a parallel requirement exists to press forward aggressively with simulation, modeling, and gaming techniques to resolve doctrinal and procedural issues related to these C^3I systems use. In this way, the resources of the human mind and experience can best be utilized to solve the very complex problems brought on by advanced weaponry and their supporting systems.

Systems of Force in the Year 2010

By the year 2010, our military world will be essentially an electronic driven one. The Soviet Union believes this and is preparing for such an eventuality in 21st century warfare.

Soon-to-be-available technology might well provide new communications and computers that will combine to pass massive amounts of refined information rapidly around the world to military and political decision-makers.

Also, knowledge-based systems will assist staff and decision-makers in choosing the right options. Video displays and video conferencing will connect theater commanders to each other and to national capitols while permitting highly flexible and diverse networking between political leaders, commanders and individual combat units. This political-military relationship must be accepted as a fact of the 21st century.

Weapons delivery should become surgical under C^3I control. Platforms will be electronically directed with human over-ride. Battles will be delayed until the last moment as sensors and

countermeasures duel as a prologue.

Lasers, fibre optical acoustics surveillance, artificial intelligence and physics not yet technologically developed will form our C^3I lexicon of tomorrow.

The question to be asked is: "Are the submarine systems of force tuned to the times ahead?"

Jon Boyes

SMART SUBMARINING MAKES THE OCEANS MORE OPAQUE

The submariner who takes advantage of the ocean's anomalies in the vicinity of his submarine and who knows the limitations of his enemy's submarine detection gear can, seemingly, make the oceans more opaque for enemy ASW efforts. An appreciation of today's means of detection and tracking of submarines then offers valuable clues for the tactics to be used to escape detection. To this end, this article will concentrate on identifying factors which affect the success of wide area antisubmarine search operations by acoustic and non-acoustic detection devices, while suggesting ways for a submarine to minimize their success.

Acoustic Methods for Wide Area Search

Of all the signals relied on to find submarines, acoustic ones are the most prominent. Two types of acoustic signals are used in the detection of submarines, active sound bounced off a submarine's hull and radiated energy generated by a submarine -- which includes a target submarine activating its own sonar or incidental noise produced in submarine operations from disturbing the water through submarine movement, propulsion noises, and the utilization of internal

machinery such as motors, pumps and gears.

If the oceans are to be made relatively transparent for detection of a submarine's radiated energy, improvement in passive detection devices anchored to the ocean floor or ones towed from surface ships, show the greatest promise.

For detecting a submarine by bouncing sound off its hull, high powered sonars are indicated. However, highly powerful sonars used in large area search have to contend with an extremely serious reverberation problem. The greater the power, the more a sonar produces multiple echos which drown out the return of desired signals. Moreover, the direction as well as the intensity of sound are affected by factors which vary markedly depending on geographic location as well as the time of day and year. These factors include: the concentrations of sedimentary inorganic particles, tiny sea organisms, detritus, schools of fish, gas bubbles, and other such objects which can scatter or absorb sound. In addition, there are horizontal or vertical boundaries in the water column which can duct, refract, block, or attenuate sound. The most significant of the horizontal boundaries are the separations between layers of sharply differing temperature characteristics.

The discontinuities represented by the boundaries between each layer coupled with the effect on sound direction of the pressure and temperature characteristics of each layer can cause some of the sound to be ducted or channelled between the boundaries. Thus, the hearing of submarine radiated noise can be excellent within a duct. However, submarine detection can be hampered if the target is in one layer while detection devices are in another.

Some sound which travels steeply enough to penetrate from one layer to another, while

undergoing attenuation and refraction, can make it into the deep sound channel where it can travel horizontally for great distances -- for thousands of kilometers -- with relatively little attenuation except for spreading and absorption.

Cutting across horizontal boundaries in the water column are vertical ones associated with ocean eddies, fronts, the interface between two currents, and the presence of underwater mountains and ridges. Such boundaries can stretch for hundreds to thousands of miles, and, as with horizontal boundaries, can affect submarine detection if the boat is on one side and the acoustic sensor on the other. For example, a submarine detected in the Labrador Current but crossing into the Gulfstream has been compared to a person going from an open field and "disappearing into an adjoining woods."

No less important is the interweaving effect on sound velocity of the water's temperature, pressure, and salinity. Decreases in each of these contribute to a decrease in velocity, and sound waves will bend or refract as much as 15° toward those water areas which permit slower speed. The bending can make for highly complex sound propagation paths and produce "shadow zones," i.e. areas where sound does not penetrate. Thus, a hydrophone might not hear a submarine even though both were quite close and in the same temperature layer. Similarly, active sonar emissions might be bent away from, and thus not reflect against, a target even when the latter is near the sonar and again in the same layer.

In addition to shadow zones, the bending of sound waves cause the formation of "convergence zones," and these can be beneficial to the detection of shallow submarines by sensors placed near the surface many kilometers away.

Yet, if a submarine is to be detected, ASW forces must contend with more than the sound transmission qualities of seawater. The world's oceans are rather noisy. Ocean life, the actions of the wind on the surface, human uses and exploitation of the ocean and seabeds -- all contribute to the generation of ambient noise which mask or mimic desired signals. It has been noted that ambient noise has worsened because of the greater frequency of ocean drilling and increased numbers of very large tankers and bulk carriers plying the oceans.

It may be argued that the more oceanographers and acousticians learn about the variability of ocean conditions, the more opaque the oceans are seeming to become. In contrast to viewing the oceans as a relatively stable mass of water, but turbulent at the surface and crisscrossed by great currents like the Gulf Stream, oceanographers have come to appreciate the ubiquity of eddies cutting vertically across the water column, disrupting horizontal transmission of sound even in the deep SOFAR Channel. It is not that oceanographers have been unaware of eddies, but rather that they have not appreciated how widespread they really are. Another basis for the opacity claim is provided by RADM R.A. Geiger: "Recent basic research has revealed that the ocean is quite complex, and in many respects is analogous to the atmosphere: it contains the oceanic counterpart of atmospheric weather. This oceanic "weather" consists of highs, lows, fronts, jets -- which, relative to ocean climatology, travel quite rapidly. The sharp temperature gradients associated with this weather are known to cause rapid changes in sonar conditions and provide acoustic shadows that obscure an object from detection."

Seeking out acoustic shadows is one obvious countermeasure a submarine can use to avoid detection. Others include; going slow and

maneuvering gently and staying out of ocean temperature layers which can transmit sound to adversary acoustic systems.

Should the improbable occur -- a very effective long-range acoustic detection system -- there would still be the problem of false alarms which would require ASW forces to adjust their sensor in terms of probability of detection versus probability of false alarms. But to adjust a sensor so as to increase the threshold of acceptability of a signal, and thus eliminate false alarms, also risks losing true signals. Improved signal processing increases the probability of correctly sorting through incoming sounds. Still, ASW forces must always decide on the balance between detectability and false alarms. Making this balance may, however, do little to screenout signals deliberately generated by a wily adversary who realizes that decoys, jamming, and even physical disruption of adversary acoustic systems can be cost-effective.

Acoustics in the Arctic

In the Arctic, a submarine which remained under the ice might be particularly difficult to find. Most of the sounds produced by a submarine do not tend to travel great distances for two related reasons: (1) the entire composite spectrum of submarine-generated noise is confined to a frequency range between 10 and 1,000 Hertz or so; (2) the transmission of sound in the Arctic degrades rapidly with increasing frequency above 20 Hz. It is better than it would be in the ice free field out to some range and is poorer beyond. This is the result of opposing influences on the propagation. At short and moderate ranges, ducting due to the ice cover improves the transmission, but at long ranges the repeated encounters with the under-ice surface degrade it. In short, nearly the entire spectrum of submarine-generated sound is in the frequency range which

degrades rapidly.

Most of the degradation of under-ice sound is due to numerous ice ridges with keels extending downward from the ice canopy. Their spacing is generally random, some are quite deep, and they are important not only because they absorb sound but also because if a ridge is large enough it provides a submarine with a near perfect place to hide. By lying quietly against an undersea keel, the noise generated by the submarine would tend to be refracted upward against the ice. Should an adversary utilize sonar to search actively, the echos would reverberate against the surface. Hence, any coherent return would probably not distinguish the submarine from the overhead ice.

Non-acoustic Methods for Detecting Submarines

No system is yet operational for detecting a submarine in a broad ocean search -- if the submarine refrains from an activity such as communicating externally, activating radars, or firing weapons serving to give away its position. The most widely applied nonacoustic sensor today is the magnetic anomaly detector, MAD. But the disturbance in the earth's magnetic field by a submarine which is detectable by MAD is inherently short-ranged. Thus, even with a highly sensitive MAD detector, the system is more suited for narrow barrier and localization than wide-area search.

Compared to some acoustic signals, none of the submarine-generated nonacoustic signals propagate far. As a result, if a nonacoustic system does become operational for searching large areas, it will probably involve observables which persist behind the submarine in its wake and are detectable by air or space-based sensors. The greater the persistence, the longer the spatial extent of the signal and the better the opportunity for detecting it. Similarly, the higher the sensor can be while operating, the more

extensive is the area it can cover in a short period. The observables potentially detectable by air or space sensors appear to be: contaminants, thermal scars, wake turbulence and internal wave effects.

Contaminants

A submarine introduces a variety of products into the ocean or the atmosphere above. These result from the leeching of anti-fouling paint, the leaking of lubricants from propeller shafts, the dumping of wastes, the corrosion of a submarine's hull and propellers, the formation of radioisotopes following the escape of neutrons from the nuclear reactor into the seawater, etc.

Most contaminants probably mix too rapidly and reduce themselves to background levels before they can spread far as a detectable phenomenon. Thus, they provide a better basis for localization than for wide-area search. Moreover, contaminants discharged into the submarine's wake tend to be confined to the wake which usually remains at the depth stratum of the submarine.

Because the trace element detectors used to find contaminants must be brought into the immediate vicinity of the sub's track, a submarine could release waste products when weather or intelligence suggested that no sensing unit would be present at the time of release.

Thermal Scars

Nuclear submarines ingest and then expel seawater used to cool the reactors. Consequently, great volumes of warm water are left in the submarine's wake. Since the discharged water is warmer and less dense than its surroundings, it rises and can cause a thermal scar on the sea surface detectable with either infrared or passive microwave radiometers. One Soviet author suggests

that a thermal scar anomaly on the surface could be on the order of .005° C. But to achieve a sensitivity for detecting such a scar an infrared radiometer would operate at an altitude of about 100 meters -- causing coverage to be too small for wide-area search.

The utility of space-based infrared and passive wave radiometers is questionable in that the sensor may be too far from the ocean surface and travelling too fast to be able to pick up signals of interest. Present satellite-based IR systems are most promising since they can measure tenths of a degree Kelvin with input data averaged over one kilometer. They can do this with swath widths of 2,700 kilometers which allows for wide-area search. But, true all-weather day-night sea-surface temperature data from satellites must await development of high-resolution multispectral passive microwave radiometers. Then, a serious problem is the enormous number of "false alarms" that result from local temperature differences on the ocean's surface that are generated by a myriad of mechanisms other than a submarine. E.g. natural currents can produce turbulence in the water which give rise to temperature differentials on the surface -- while thermal anomalies might not make it to the surface.

Turbulent Wake

Turbulence behind a submarine results from the turning of the propeller and the resistance of the seawater to the submarine's passage. This resistance causes both turbulence in the layer of water adjacent to the hull and an associated shedding of vortices from the edges of rough spots, the sail, and appendages. The wake resulting from these effects can propagate to several kilometers astern of the submarine and persist for many minutes.

Since the wake remains confined to the general vicinity of the submarine's depth stratum, the only airborne sensor capable of detecting a fairly deep wake is a blue-green laser, because of its unique ability to penetrate the water from above, bounce against the wake, and return to the source. Such a laser would probably be carried initially on an airplane since spacecraft utilization requires the solution of "a host of technical problems." One problem for the laser system is that a submarine which cruised deep enough might well avoid detection of its wake because laser beam penetration is likely to be only a few hundred meters. But this estimate is only nominal since local water turbidity and clouds will greatly lessen how deep a laser will actually penetrate and return to its source. Whatever the laser's depth penetration, moreover, its swath width would be limited since the beam would be thin and at near perpendicular incidence to the sea surface for effective penetration. This should seriously degrade the laser's utility for wide-area search even though turbulent wakes may persist for extended periods.

Internal Waves

An internal wave is a vertical oscillation of the water column. A moving submarine leaves behind it a wake of internal waves since the water displaced by the submarine's movement fluctuates up and down as it seeks to return to its original density equilibrium. For three reasons internal waves have the greatest potential among the nonacoustic observables to serve as a basis for wide-area search. (1) Internal waves produced by nature can sometimes persist for days so those produced by a submarine might last for hours and the wake of waves stretch for tens of kilometers. (2) Internal waves produce effects on the surface of the ocean by modulating the short capillary waves superimposed on the ocean's larger surface gravity waves. (3) The surface manifestations are

detectable by what is termed a synthetic aperture radar. The significance of this radar arises from its ability, even at satellite altitudes, to detect the manifestations in great detail and precision. It also has the advantage -- unlike infrared detection -- of being able to sense through clouds and rain. However, those who focus on surface manifestations of internal waves agree that reliance on such manifestations is presently not feasible and remains "an open question."

That there is no shortage of mechanisms for generating internal waves accounts for their ubiquity. These include surface ships, winds, surface waves, atmospheric pressure fluctuations, the movements of currents and tides over irregular bottom topography and the actions of currents at the interface between ocean density and temperature layers. In short, it is not surprising that a very high false alarm rate could attend reliance upon internal waves as submarine observables.

Space Vehicles

Spacecraft for the effective use of most ocean surveillance sensors fly at altitudes which do not exceed 1,000 km. Such low orbit satellites have a speed over the ground of about 25,000 km per hour and can circumnavigate the globe in roughly 90 to 100 minutes. Anti-satellite weapons however may put them in hazard. Still they can overfly regions where no manned aircraft would be risked except in special cases.

Spacecraft in very low orbits (such as 300 km) stay aloft only a few days before air drag effects on the fringes of the atmosphere cause them to fall towards earth. A higher orbit makes for longer endurance, but too high an altitude generally restricts the effective use of on-board sensors.

It often takes a long time before a satellite is positioned over a point of interest. A sensor which circles the earth 15 times daily in a near polar orbit between 500 and 700 kilometers, for example, has an extremely broad 2700 kilometer swath width. It would take 18 days for a sensor sweeping a narrower 148 kilometers across. By maneuvering a satellite from one orbit to another, the drag make-up system reduces the time otherwise required to have a satellite overfly a desired area. But as with the drag make-up, these maneuvers can be propellent intensive and therefore limited in number and extent.

Summary

In sum, the wide area search prospects of nonacoustic methods is based on: (1) the use of sensors operating high above the water and covering long distances in short periods and (2) the persistence of signals in the submarine's wake. When one considers however the factors which affect the generation, location and persistence of the signals, the relative utility of air and space vehicles and the characteristics of sensors operating from such craft, then it is not surprising that there is no nonacoustic system yet operational for wide area search.

Simply operating deeply and slowly, for example would probably negate most ocean surface effect signals. Nonacoustic systems could also be jammed and their communications disrupted.

On the other hand, maximizing stealth or quiet operations in an environment of antisubmarine acoustic sensing systems tends to keep the oceans opaque for detection. Use of the ocean's anomalies to reduce the effectiveness of an enemy's active sonar capabilities is also indicated.

In effect, a better understanding of the

nature of the oceans and a better appreciation of enemy ASW detection capabilities can guide the smart submariner into modes of operations which tend to make the oceans more opaque to the enemy -- rather than increasing its transparency through new technologies in the enemy's hands.

(This article has been excerpted from Antisubmarine Warfare in the Nuclear Age, by Donald C. Daniel, in ORBIS, Fall 1984, a journal of world affairs, with permission of the Foreign Policy Research Institute, Philadelphia, PA.)

STRATEGIC PLANNING IN THE SUBMARINE FORCE

(Ed. Note: With the advent of the D-5 and Land attack nuclear cruise missile, the vast number of potential counterforce and counter-military targets created puts a heavy burden on nuclear weapons planners who are doing the selective targeting for "strategic submarines.")

SUBMARINE REVIEW provides the professional submariner an insight into the history of his profession and an opportunity to discuss and debate the issues facing the Submarine Force in the future. Submariners are gradually coming to see the advantage of using their REVIEW as a forum for such debates. But we cannot debate and discuss alternative solutions to the problems facing us until we recognize what those problems are. One such problem is the impending loss of strategic nuclear planning expertise in the Submarine Force. This loss would be serious at any time. It is particularly serious now, given the growing need for a cadre of officers who understand both the nature of submarine operations and the details of nuclear weapons planning to support the increasing national importance of the strategic submarine force.

Some statistics indicate the magnitude of the problem. In mid-1984 there were 20 Navy Commanders and Captains formally designated as proven subspecialists in Strategic Nuclear Planning. Fourteen of these officers had 25 or more years of service. Five others had greater than 20 years service. Had every proven subspecialist in nuclear planning who was eligible to retire elected to do so, the Navy would be left with <u>one</u> officer in the grades of Commander or senior with demonstrated expertise in this field. In theory, there is some backup. An additional 26 Captains and Commanders are designated nuclear planning subspecialists but are not considered proven subspecialists. Their designation as subspecialists may or may not imply a degree of expertise; it is awarded after a single tour or an appropriate educational attainment and may reflect duty assignments long in the past. But even this limited backup expertise is soon to vanish. Of the 26 non-proven subspecialists, only eight are not yet eligible to retire.

Not all of these soon-to-vanish subspecialists are submarine officers, nor would it be desirable if they were. But for many years the Submarine Force provided the bulk of the strategic nuclear planning expertise in the Navy. Diesel submarine officers used their knowledge of submarine warfare and developed a knowledge of nuclear planning to become skilled integrators of operational and policy implications. The existence of the diesel submarine force allowed these officers to maintain their warfare qualifications, and thus to progress through the ranks to Commander and Captain. With the demise of the diesel submarine force, there has been a gradual shift of General Submarine Officers to career patterns in which command at sea is not an option and 20 year retirement is a likelihood. Thus, a valuable source of senior nuclear planners has essentially been eliminated.

At first this loss of planning experience in the Submarine Force may not seem serious. Competent strategic nuclear planners have come from other warfare specialties in the past and will do so again. The attack aviation community has a number of officers with solid foundations in nuclear planning. It may appear that if the supply of submarine officers dwindles, the shortage can be replaced from other warfare disciplines. Fifteen years ago this would have been true. The POLARIS submarine force, although revolutionary as the first truly survivable deterrent, was employed in a relatively straightforward fashion. POSEIDON, too, was best suited for targeting fixed, urban-industrial targets. While nuclear planning is an inherently complex function requiring considerable skill, it would not have been fatal, in those days, for nuclear planners to have no first hand experience with strategic submarines. Indeed, many of the best submarine officers who served as strategic nuclear planners in the past had not served aboard Fleet Ballistic Missile Submarines.

In this case, however, the past is not a desirable model for the future. Over the next decade the Submarine Force will assume new strategic roles requiring planners to re-think both traditional methods of operating SSBN's and of planning for the employment of their weapons. Three examples illustrate the types of issues which will face us in the next decades:

- The deployment of the TRIDENT II (D-5) missile will provide the strategic submarine force, for the first time, with the ability to engage all types of targets, not simply so-called soft targets. The target spectrum TRIDENT II will be capable of holding at risk includes many so-called time-urgent targets which will require a prompt retaliatory response. Submarine force operating and communication procedures have historically been based on the inevitably of

retaliation, not its immediacy. With no need to respond rapidly to ensure our own survival, we have been under no pressure to devise procedures to allow very rapid engagement of a variety of targets. Devising the new procedures that will be required in the 1990's while still preserving operational flexibility for the Submarine Force will demand officers with a firm understanding of both submarine operations and nuclear targeting.

- The advent of the nuclear land attack TOMAHAWK requires a whole new approach to nuclear planning. TOMAHAWK is a hybrid, a non-strategic nuclear weapon which also fulfills an important strategic role as part of the nuclear reserve. It will be carried on attack submarines which have a vital role to play in the overall maritime strategy. As both the recognition of TOMAHAWK's capability and the size of the TOMAHAWK force grow, there will be an urgent requirement for officers who understand both national and nuclear policy and the fundamentals of submarine warfare.

- United States nuclear policy over the past ten years has come to place great stress on the concept of endurance -- the notion that it is important to have forces which can survive and remain available long beyond an initial strategic exchange. Such forces insure that an adversary cannot believe that he can achieve his aims, even after the U.S. has absorbed a major strategic strike. Enduring forces are thus particularly important for deterrence. Of all U.S. strategic forces, SSBN's are clearly the best able to provide that endurance. The operation and employment of an enduring submarine force is yet another case where knowledge of both nuclear planning and submarine operations will be essential.

If the United States is to make intelligent use of the tremendous capability of its strategic submarine force in the coming decade, we must

reverse the precipitous decline of nuclear planning expertise within the Navy in general and the Submarine Force in particular. It is not necessary nor desirable that specific flag billets be designated as requiring extensive backgrounds in strategic nuclear planning. Experience with the Joint Strategic Target Planning Staff, and since the formation of the Strategic and Theater Nuclear Warfare Division in OPNAV, has demonstrated that flag officers with solid backgrounds in submarine operations perform superbly in this area. But these flag officers must be supported by staff officers with detailed nuclear planning backgrounds. What is necessary is to ensure that in the future the Commanders and Captains with the appropriate planning background will be there.

We require action on two fronts. For the short term, to deal with the impending loss of virtually all Commanders and Captains with nuclear planning expertise, we must aggressively seek out those who remain to ensure they are used in those high priority areas where their expertise is needed. In addition we need to actively recruit new Commanders and junior Captains into this arcane but vital area. We also need to take the best General Submarine Officers with SSBN weapon experience and ensure that they are channeled into the nuclear planning community -- and that their immense importance is recognized by selection boards.

In the long-term the solution lies in finding a replacement for the diesel submarine community as a source of strategic nuclear planners. Since the planners of the future must have a firm grasp of submarine operations, they can only come from the nuclear submarine community. We should begin now to fill Navy billets on the Joint Strategic Target Planning Staff, Joint Staff Intern Billets and quotas in the Navy Postgraduate School revised Nuclear Planning Curriculum with nuclear trained submarine officers. Such assignments need to have

an equal claim as other so-called hard core submarine requirements on our best officers. Having sent some of our best young officers to these billets, we must ensure they return to the Submarine Force and progress up the professional ladder. The answer is not to develop a community of nuclear specialists; rather we must develop true subspecialists -- knowledgeable in both the field of submarine warfare and in the world of strategic nuclear planning.

Traditions of the Submarine Force are almost exclusively tactical. No one ever tells sea-stories of maintaining alert coverage or building a better target footprint library or making improvements in SIOP planning factors. But like it or not, the Submarine Force is the Navy's strategic force -- a force whose capabilities grow more and more important each year. If the nation is to have the full benefit of that capability, we need to reestablish a core of submarine officers with nuclear planning expertise. And we need to start NOW.

CAPT L. F. Brooks, USN

SOVIET SUBMARINE COMMAND AND CONTROL

It is highly important that the Soviet command and control of their submarines be understood. This is necessary if the command and control of our own ASW forces -- of which submarines are an important part -- is to operate effectively. Soviet command and control differs from ours in several ways, some of which are distinct shortcomings. Hence a knowledge of these differences presents an opportunity to use them to our advantage. The balance between the U.S. and the Soviets in underseas combat may easily lie in a correct reading of Soviet command and control concepts and how they accomplish them in their present practices.

First, it should be noted that the terms C^3 or C^3I, as used by the U.S. are not used in Soviet command and control theory. The Soviet's approach seemingly uses C-EW to describe the function of command and control. C, to the Soviets, means "control", while EW is "electronic warfare" to cause the enemy to lose control of his forces. The other elements of command and control, i.e. communications, command, intelligence and navigation, are treated as only ancillary factors. Though these supporting elements are basically similar to those of the U.S., "control" and " EW" have far greater emphasis and show some subtle differences.

"Control" is the secret of successful Soviet offensive operations. And, EW is the means to insure the survivability of control of Soviet forces -- by neutralizing an enemy's means of control which he might use to oppose a Soviet offensive action. "Control" is examined in great depth by the Soviets and control is seen as "a dynamic quality of military force employment which changes with different situations, different political objectives and different rules of engagement." A Soviet officer knowingly writes that "the outcome of a naval action hinges on the status of force control." Admiral S. Gorshkov, Head of the Soviet Navy, emphasizes the quality of "control" which is being achieved "only by the use of automated control systems." He considers this to be "a new weapon" capable of reinforcing "the intellect" of the military commander. It is, according to the Admiral, "a quasi-collective intellect" which concentrates the theoretical knowledge and experience of many military commanders and which makes the "control" decisions in the Soviet Navy. Hence for submarines, decision-making by a central Commander or by a CO of a unit, is necessarily computer-assisted. This application of computers, according to ADM. Gorshkov, "concentrates theoretical knowledge and

the experience of many military commanders in a form which assures its utilization by any CO with due regard to the specific situation which has arisen." Such a situation will be defined for computers from the situational-data entered. The volume of this data is likely to be so great that only through computerization can it be synthesized to a form where it can be related to the mathematical algorithms and programs in the computer complex and provide decision-making suggestions. Yet, Admiral Gorshkov notes that "the final control decision of the officer-in-charge will always be subjective, with selection objectively substantiated by the computer's output." This does not rule out a creative approach by a CO for solving the problems at hand. Wisely, the Admiral also recognizes that "even among indecisive officers-in-charge, an original (computer) search for the best decision cannot continue endlessly," and a plan of action must sooner or later be determined by a hesitant CO. Thus "control" of submarines is not likely to result in a form of inaction and missed opportunity as too often occurred in submarine operations during World War II. Admiral Gorshkov's belief in the increased efficiency of "control" in modern day operations -- despite "their large spatial scope and the shortening of time for decision-making by an officer-in-charge" must also be evaluated in light of the impact of a political commissar on each staff or with each submarine. It is clear that this Party representative, who is likely to be close at hand when major operational decisions are made by an officer-in-charge, will try to ensure the "ideological purity" and consistency of such decisions with Communist Party military policy. This additional factor, acting on the "control" of a submarine, is foreign to Western concepts but should be recognized when optimizing Western antisubmarine command and control functions. Although such a political officer has been made a watch stander on most submarines, it is unlikely

that he would have adequate tactical knowledge to either approve or disapprove a CO's control decisions. Hence any departure by the CO from doctrine or the suggestions ground out by a computer's Party policy sanitized programs, would likely be viewed as a form of deviationism and would tend to be suppressed. Thus, the political officer has a certain overriding effect aboard a submarine, because he can report a CO's "deviationism." Hence creative responses to tactical situations by the CO become far less likely. The isolation of the submarine in its operations effectively prevents a rapid resolving of such differences by higher authority. This is unlike the functioning of the political officer on submarine staffs where his suspicions as to a Commander's deviationism can be resolved quickly.

Another area of concern, relative to the control of submarines, is the lack of initiative shown by Soviet individuals in general. This is evident from the numerous articles dealing with the means to improve initiative in military operations and is probably the product of the Communist Party's stifling domination of all Soviet citizens in their public life. Its effect on the CO's control of his submarine, while in action, needs to be evaluated for the advantage that might accrue to our own ASW forces.

The Soviets also emphasize the need to appreciate an enemy's policies, ideology, organization and military doctrine as well as the character of its commanders. By so doing, their own command and control efforts are conducted more profitably -- particularly if U.S. submariners are not doing their homework along these lines.

The efforts used to galvanize initiative, the inhibiting effect of the political commissar, and the consequent dependence on doctrinal policy-sanitized computer solutions should make a Soviet CO's control of his submarine predictable in

critical tactical situations. His penetration of a convoy screen, his reaction to various types of enemy ASW effort, his responses in a short-range melee-type of engagement, his role in coordinated multi-unit operations, etc., should be recognizable if the performance of Soviet submarines is carefully studied in peacetime and patterns of action recognized from the considerable writings of Soviet leaders on the subject of "control."

As suggested earlier, in addition to controlling Soviet submarine forces with existing assets, the Soviets stress the importance of disrupting an enemy's control mechanisms in order to ensure the survivability and continuity of Soviet elements of control. "Radio-electronic combat" (EW) is the essence of this form of control of the enemy's command and control systems. Jamming enemy sensors or physically destroying them are the main measures employed. Moreover, by obtaining intelligence on the enemy's control network, the Soviets feel that they can deny up to 50% of his communication capabilities and his intelligence collection. A capability to jam U.S. submarine broadcast frequencies except for the ELF ones, has been demonstrated by the Soviets over the past few years. In addition, the Soviets see the use of deception -- false information, use of decoys, camouflage, etc. -- and electronic counter-counter measures as providing a protection of Soviet "control" systems from enemy efforts.

"Control" in Peacetime Operations

The continuous peacetime pattern of up to half a dozen Soviet SSBNs deployed individually for deterrent effect as well as a few SSNs (which include the guided missile attack boats) for gathering intelligence and gaining operating experience, appear to be under a form of control similar to that used for U.S. submarines. Command

and control of such Soviet submarines is evidently exerted by the theater submarine commands. One difference however is probable. Because of the central control of a single land based command for coordinated world-wide operations at the commencement of a big war at sea -- as illustrated by the two major OKEAN exercises -- the geographic plots of surface ship and submarine activity on the oceans would be kept by the overall central command and by the theater submarine commands, rather than by individual submarines using some form of Outlaw Shark system. Control of targeting of Soviet submarines for an initial major strike against an enemy would then be by the central command assisted by the theater submarine commands. Only after an initial "first salvo" type of attack would control shift to the submarine CO for uninhibited "mop-up operations." The communications to submarines needed for such an evolution tend to be sparse, hence non-alerting and virtually all one way -- to the submarines.

The coordinated submarine operations which are probably practiced in peacetime include: transits involving the mutual support of other submarines and possibly surface ASW units as well as aircraft; multi submarine trailing of enemy SSBNs; ASW protection of own SSBNs; and operations with a surface strike fleet. Unlike the centrally controlled initial "first salvo" type of massive strike against enemy units wherever, these coordinated operations will necessarily be controlled by an on-scene commander -- although the details of such operations are only of the sketchiest variety in the Soviet unclassified writings which were researched. Doctrinal methods for conducting such coordinated operations should be well established in computer programs -- both for the officer-in-charge and for the unit commanders. This computer-aided doctrinal approach to coordinated operations is indicated for all military forces as well.

Admiral Gorshkov also stresses the extensive use of computers to aid staffs in preparing plans rapidly for their Commander. The Admiral's emphasis on "the new tempo of operations" which calls for amongst other things, rapid staff response to a particular opportunity -- one due to weather, own success in a deceptive action, an enemy error in strategy, etc. -- also calls for close integration of staff personnel with their computer aids. The Admiral notes that "The primary purpose of the automated control system is to make the most expedient decision to assure maximum utilization of the potential resources of the forces", and that "with the help of mathematical models the staff receive neither a project, nor an operations plan, but only the quantitative recommendations to work out the best variant for operations, suitable for the situation which is taking shape." The reasoning behind this emphasis on computer aided staff work is that, if a plan can be generated swiftly and the operations commenced rapidly in response to a plan, the enemy will be taken by surprise -- not necessarily due to being caught unaware of what is happening but actually unable to respond quickly enough and adequately enough because of the great speed with which offensive operations have been laid on.

Control of Strategic Submarines

Such "control" involves both ballistic missile submarines as well as those armed with Tomahawk-like nuclear tipped cruise missiles. Recently, Soviet intercontinental strategic nuclear forces were apparently brought together into a single organization, a Strategic Nuclear Forces (SNF) Command. Operational control, then, of Soviet strategic submarines is vested in a Navy nuclear commander-in-chief who reports directly to the SNF Commander-in-Chief. The CO of a submarine employing strategic weapons merely carries out the orders of his higher command. Whereas Soviet SSBNs were formerly expected to play a role in an

initial massive nuclear exchange, today they appear to be planned as a strategic reserve -- a survivable blackmailing force for late-war bargaining and an influencing of peace terms. There are indications that Soviet SSBNs will operate in protected bastions close to the Soviet homeland or under the Arctic ice cap. VLF and ELF broadcasts through the ice to the SSBNs should be satisfactory while underwater telephone communications with protecting SSN units also appear satisfactory though not totally secure in their transmissions.

Control of the "first salvo"

As demonstrated in the OKEAN exercises of '70 and '75, control of Soviet forces worldwide for a "first salvo" initiation of a war at sea is contemplated and would be executed from a single shore based command center -- near Moscow. Satellite communications insure the reliability of this central control. Enemy battle groups would be located geographically by mainly airborne means and become designated targets for Soviet submarines operating in their proximate vicinity. The central command would promulgate an overall plan of action, probably giving a time for missiles on target rather than a time for initiation of attack. This would tend to achieve a near-simultaneous attack effect from widely dispersed firing platforms whether submarine or long range aircraft and also tend to overwhelm enemy defenses because of the saturation nature of such an attack. Decentralized submarine commands sort out information on the enemy and the theater environment and keep attack submarines updated on target and operational information through mainly VLF broadcasts. They might also issue qualifying control directions to their submarines to insure a conformity with the overall plan. The COs of the Soviet attack submarines (both SSGNs and SSNs) should remain under control of their submarine commands until their launch of missiles. Then

control of the submarines would shift to the CO and the individual units would be released to conduct evasion action or mop-up operations against the ships of the crippled enemy battle group under attack. Shifting from land based to onboard control is probably a matter of doctrine. During mop-up operations several Soviet submarines are likely to coordinate their torpedo attacks using underwater telephone communications -- the senior commander of the group of submarines assuming tactical control in accordance with doctrine.

Control of Supported Submarines

Unlike the U.S. with its preference for lone-wolf operations, Admiral Gorshkov stresses the need for supported submarine operations wherever possible. This means that submarines are invariably working in close coordination with other submarines, surface ships or aircraft. Offensive strike operations are then likely to be coordinated with land based long range aircraft, satellites and other submarines. While protective operations for SSBNs, transitting submarines and defense of coastal areas will tend to involve surface ASW units and other submarines. In any case, reliable communications between all units are essential for effective operational coordination. Such communications are assured through considerable redundancy of means, while close adherence to established tactical doctrine is dictated to ensure a minimum use of communications.

In summary, it is "control" that is the essence of Soviet operations. And, this "control" of Soviet forces is insured by crippling those control systems of the enemy, through electronic warfare, which support the enemy's efforts to counter Soviet sea forces.

Phoenix

An Opinion On Submarine Officer Qualification

The submarine force is proud of its rigorous qualification programs for officers and enlisted personnel. The foundations of these programs are so sound that they are used as the bases for Navy wide qualification programs and of other warfare communities. Because of the emphasis placed on submarine qualification, the junior officers of the submarine force have, over the years, developed as knowledgeable professionals who continue the proud traditions of the United States submarine force. However, it seems that the present officer qualification requirements may be too all-encompassing, detailed, and extensive so as to detract from the valuable learning experience offered by qualification. In fact, some junior officers are likely to become demoralized by the great number of qualification cards requiring action and the mass of knowledge which must be acquired. Without proper supervision by experienced officers, the knowledge level expected of experienced department heads may be required, creating an unnecessary burden on the qualifying J.O. This is particularly critical since, at the onset of qualification junior officers are excited at the imminence of being qualified in the foremost warfare specialty and that they will shortly be qualified to stand a watch which directs the movement of one of the nation's most costly, complex combatant warships.

Qualification requirements are currently contained in a joint force instruction entitled "Line Officer Requirements for Qualification in Submarines." Included are seven qualification cards varying from the "Officer Basic Orientation Card" to "Qualification in Submarines, Line Officer Requirements." The average "attack" submariner will be required to obtain nearly 540 different authenticating signatures on his qualification cards, while his SSBN counterpart needs nearly 570. As an example of the volume of

material involved, the Officer of the Deck qualification card is 77 pages long. In addition to the cards, is a detailed library of 135 references which are utilized during the qualification process -- dependent upon individual ship configuration. The requirements for authenticating signatures range from practical factors such as "hovering with the trim pump" to nearly a full page of knowledge requirements necessary for a check-out on "passive sonar performance prediction."

In order to be designated as "Qualified in Submarines" an officer must have served on an operational submarine for at least one year and it is expected that junior officers will complete their submarine qualification in less than eighteen months. Included in this eighteen months would be four months (six months for SSBN officers) allotted for Engineering Officer of the Watch / Engineering Duty Officer qualification. The number of signatures described above do <u>not</u> however include qualification requirements specified for the nuclear propulsion plant or SSBN weapons duty officer.

Qualification cards were certainly developed with the intent of simplifying the qualification process while improving the qualifying officer's level of knowledge. One of the goals of these cards was to standardize qualifications between Atlantic and Pacific forces. In addition, rather than leaving the extent of knowledge required to the authenticating officer, qualification standards were developed and are included in the qualification cards. No longer do junior officers have to ask: "What do I need to know to get this signature?". Fortunately, a detailed bibliography is referenced in each applicable signature section, eliminating an extensive hunt for references needed to obtain the requisite knowledge for a check-out. A major supplier of needed information is the extensive Naval Warfare

Publication library -- which did not exist until the middle seventies.

What makes qualification a formidable task for our junior officer? The J.O. is trained from "day one" of nuclear power training to strive for and assimilate an extensive, detailed knowledge of each and every nuclear propulsion plant system. To achieve this, the junior officer spends a full year in shore based training at nuclear power school and a propulsion plant prototype. This provides a significant core knowledge that simplifies qualification on the first at-sea propulsion plant. Initial "qualification" becomes essentially an advanced level requalification, using the systems and principles developed in the previous year. The Submarine Officer Basic Course at Sub School provides the J.O. with an initial base for his submarine qualification. Yet, because of the additional great amount of knowledge required to complete "forward" qualification, the core knowledge received prior to reporting to a J.O.'s first submarine is just a beginning. Most of the required knowledge for qualification is therefore learned for the first time during the qualifying period. Because of the emphasis on detail in nuclear power training, the qualifying J.O. tends to believe that an extensive, detailed knowledge of each and every system is desired for submarine qualification. This is not an undesirable goal -- at face value. However, because of the great mass of information to be learned, as required by the qualification cards, completion of submarine qualification within eighteen months is an <u>exceptionally</u> difficult task.

It should also be remembered that these same officers are tasked to serve as division officers for ten to fifteen people. A J.O.'s time is quickly consumed by: formal maintenance procedures that he must research and technically approve before forwarding them on to his department head

and commanding officer; the routine leave/special request chits/personnel-related administration that must be promptly reviewed and forwarded; the different groups of evaluations that must be prepared; the two PMS systems (nuclear and non-nuclear) that many division officers must verify and approve; the five hours of formal lecture training which a nuclear division officer must attend each week; and the extensive ship and engineering drill programs which ensure today's level of proficiency. As a result, the standards of performance both for a division officer and a qualifying officer tend to be varied in order to satisfy the basic minimum requirements of each. This is, in itself, counter to the pursuit of excellence that our junior officers are ingrained with, throughout their initial nuclear power training.

Despite the diversions during qualification, junior officers still manage to get their dolphins in the requisite time -- in most instances. This is achieved by several means. Foremost is the hard work and late hours spent -- sacrificing sleep at sea and sacrificing time with family in port. The XO's and CO's attempt to get the officers off the submarine by 1700 when in port. But it is often futile, and extra hours on board for pursuing qualification become the norm rather than the exception.. The Submarine Officer Basic Course is designed to alleviate the problem somewhat by recommending that Commanding Officers sign off 39 knowledge factors based on the training the J.O. has received at Sub School.

Preventing the qualification program from becoming demoralizing and overly comprehensive must become the responsibility of our experienced department heads and those more senior. Although tasked with significant other duties, they must take time to train the junior officers for their qualification. This certainly is not a new idea. But it is one that has been pushed aside because

of the management requirements burdening our department heads due to the technical complexity of today's submarines. This problem is aggravated because department heads usually have only one prior sea tour under their belts. These experienced officers must instruct their junior officers that for every check-out there is knowledge that is core and need-to-know, and that other knowledge is merely background "graduate level" and nice-to-know. And such knowledge will ultimately be gained with experience on board and later at the Submarine Officers Advanced Course. As an example, a qualifying officer should not have to understand the specific circuitry of the AN/WLQ-4 "Sea Nymph" ESM system in the same detail which is required for a satisfactory check-out of the Protection and Alarm System of the nuclear propulsion plant. He should rather learn how to tactically use the information supplied by the Sea Nymph system -- leaving its operation to Electronic Technicians. This obviously includes an understanding of the capabilities of the system. It should be remembered that the goal in submarine qualification is to make a procedurally and tactically competent watch officer and not to make an experienced department head or enlisted technician. Many, like myself, have been told by their first commanding officer that professional knowledge comes primarily as a result of watch standing -- not as a result of pre-qualification study. It is therefore important that junior officers get on the watch bill and wear their dolphins as early as is professionally tolerable.

The qualification program must not be allowed to devour junior officers. The standards expressed in the qualification cards should be reviewed to reduce rather than expand the required amount of knowledge. Junior officers should not be expected to qualify on their own -- as many have had to during their qualification. Qualified officers should lead the J.O.'s through their qualification process, not nursemaiding, but

teaching and prioritizing an extensive knowledge base, ensuring that the core knowledge is learned and that excessive time is not wasted on peripheral knowledge that tends to delay qualification. The junior officer should continually be able to see the goal of qualification in sight and those responsible for this process must ensure that the J.O.s qualify expeditiously and move ahead smartly with their professional growth.

LCDR Russell A. Pickett, USN

1948: The Year the Russians Came

The "forward deployment" of the Soviet Navy away from home waters is commonly dated back to the mid-1960s, and Moscow's decision to do so is usually attributed to two events: first, the Soviet debacle at Cuba in 1962 along with Soviet recognition of the need for a "blue water" fleet, and secondly, the U.S. Navy's deployment of the Polaris strategic missile submarine. Soviet forward deployment is also usually associated with the most visible component of the Soviet fleet - the surface combatants, even though Soviet submarines operated in the Mediterranian Sea, from Albanian ports, for a number of years during the 1950s and early 1960s. There is also evidence that Soviet submarines forward-deployed, if not year-around, then certainly on a fairly routine basis, almost 20 years before Admiral Gorshkov ordered his ships to overseas areas. Moreover, there is at least one documented sighting of a Soviet submarine off Norfolk, Virginia as early as 1948 - 14 years before the Cuban missile crisis when, according to some sources, "the Soviet underwater fleet made its first appearance in Western Atlantic waters."

A report prepared in 1949 by the Office of Naval Intelligence, "Recapitulation of Soviet,

Satellite and Unidentified Submarine Contacts", a then top secret but since de-classified document -- provides an intriguing insight into the pattern of early post-World War II Soviet long-range submarine patrols and the apparent strategic military interests that prompted them.. The general impression is that even while the Soviet naval posture as a whole in the late 1940s was dominated by close-to-home defense, Soviet submarines participated in systematic patrols of key U.S. strategic areas possibly approaching to within visual distance of the U.S. coastlines.

It is useful to note that no Soviet submarine in 1948, with the exception of the ex-German boats the Soviets had appropriated, carried snorkels. The first snorkel-equipped boat of Soviet design was the Whiskey class that made its appearance in 1952. The implication is obvious: Soviet submarines in 1948 had to spend most of the time on the surface and were therefore quite susceptible to detection by ship or aircraft. The most capable Soviet long-range submarine at the time was estimated to have a maximum underwater endurance of 160 nautical miles at a speed of 2.9 knots before exhausting its batteries. This constraint, and considering that the Soviets could not benefit from friendly overseas ports of call, makes the geographic span of their submarine patrols in the late 1940s all the more remarkable.

U.S. West Coast Sightings

A rash of unidentified submarine sightings was reported in 1948 up and down the California coast from as far north as the San Francisco peninsula to south of San Diego. None of the 16 individual contacts are confirmed as "positive"; in fact, all but six "possibles" are registered as "doubtful." Commenting on the large volume of West Coast sightings, ONI cites "inexperienced observers;" it is indeed difficult to take seriously, for example, the sighting of a

submarine off the Monterey peninsula by "2 soldiers from porch at service club at Fort Ord." Not all of the observers were inexperienced, however. One alleged sighting of a submarine periscope on June 23, for example, was made by the submarine USS BLOWER (SS 325). Nevertheless, the apparent pattern of the contacts is an intriguing one that, taken as a whole, may be more creditable than the individual reports. The figure shows the geographic distribution and dates of the reported sightings off the southern California coast. "Doubtful" contacts are marked "X", and "possibles" with "O."

The Soviets would certainly have had good reasons for their submarines to have a closer look at the area. Besides the important U.S. Pacific Fleet bases at San Francisco, Long Beach and San Diego, the northernmost islands in the Santa Barbara Islands chain were (and are) a part of the Fleet's southern California operating area, and were used extensively for naval gunnery and mine warfare exercises. The southern California coast was also rapidly becoming the center for the Navy's missile experiments. The Naval Air Missile Test Center at Pt. Mugu, north of Los Angeles, was where the USS CUSK (SS 348) made the first submarine-launch of the Loon missile (a copy of the German V-1 "buzz Bomb") in December 1947. A second launch from the waters off Pt. Mugu occurred on May 5, 1948, at the height of the local sightings.

U.S. East Coast Sightings

If the validity of the West Coast sightings remains in doubt, the same is not the case on the opposite side of the continental United States. A total of ten contacts were documented off the East and Gulf Coasts - five "doubtfuls," four "possibles" and one "positive." Most sightings were reported in the Gulf of Mexico, usually by civilian shipping and airliners. One sonar

Reported Submarine Sightings

Off California Coast, 1948

contact was made by a Navy submarine chaser in the Key West operating area, and was rated as "possible."

The single reported "positive" identification occurred on October 31 off Norfolk, Virginia, and was based on a sonar contact and the sighting of a periscope by the destroyer USS GHERARDI (DD 637) and the minesweeper/escort USS TOWHEE (AM 388). The report comments that this was "the first and only positive contact on any coast of the U.S." It also suggests that two subsequent "probable" sightings off Block Island may have involved the same "single Soviet submarine on reconnaissance patrol."

The Eniwetok Sightings

Eniwetok, a tiny atoll in the Marshall group of islands, is situated some 200 nautical miles from the even smaller Bikini atoll that was the site of the first U.S. post-war nuclear weapon tests, in 1946. Eniwetok Proving Grounds had been established for the second series of nuclear detonations in 1948. Three shots with yields varying from 18 to 49 kilotons were held: X-ray on April 14, Yoke on April 30 and Zebra on May 14. Preparations, including the construction of the 200-foot towers that held the devices, began months ahead of time.

The ONI report shows that the activities on and around Eniwetok were closely observed by at least one Soviet submarine. One "doubtful" and three "possible" sightings were made between February 20 and 24, with the latter credited to destroyer sonars, and the single "doubtful" based on a shore-based observation. The presence of the uninvited visitor was confirmed on March 3 with a visual sighting by a Navy aircraft. No further contacts are reported during the next two weeks, but another series of three "possible" and "doubtful" sightings by aircraft and surface ship

radars are logged over the following week.

Looking Back

The presence of Soviet submarines off the U.S. coast is common knowledge today. When Moscow warned, earlier this year, that the stationing of cruise missiles and Pershing IIs in Western Europe would prompt deployment of additional Soviet strategic missile submarines off U.S. shores, the common reaction in Washington was "so what" - they have been doing that for almost 20 years. Similarly, few people raised eyebrows when the television news reports showed a Soviet Victor III class nuclear attack submarine wallowing in the seas between the Bahamas and the U.S. East Coast in the fall of 1983. The year 1948 was different; knowledge of the activities of the Soviet submarine fleet was tightly guarded while U.S. defense planners tried to fathom Stalin's international intentions. It was the year that the deteriorating relationship between the Soviet Union and its erstwhile wartime allies plunged into the Cold War -- with the Berlin Blockade, the dispatch of "nuclear-capable" B-29 bombers to Western Europe, President Truman's signature of the Marshall Plan, and the adoption of the Vandenburg Resolution with its promise of U.S. military aid to the free nations of the world. War with the Soviet Union seemed one step closer, and fresh memories of the battle of the Atlantic against the U-boats underscored the apparent threat of the Soviet Union's huge submarine fleet.

It is not known what, if any, influence the upsurge in the activities of the Soviet submarine fleet in 1948 had on U.S. defense policy. What is known, however, is that preparations for anti-submarine warfare became a much more serious issue with the Congress and the U.S. Navy shortly thereafter. One important undertaking that followed, in 1950, was Project Hartwell - the formulation of a long-range U.S. Navy program to

counter the Soviet submarine threat based on the recommendations of a group of prominent anti-submarine warfare scientists and approved by Admiral F.P. Sherman, the Chief of Naval Operations. Many of the U.S. Navy's anti-submarine measures today can be traced back to the endorsements contained in the Hartwell report: the installation of the sound surveillance system (SOSUS) arrays on the ocean floor, the creation of underwater nuclear weapons, the continued development of the dipping sonar helicopter, and the nuclear attack submarine.

Jan S. Breemer

THE ALBACORE MEMORIAL

On May 4th, 1985, (tentatively) the ALBACORE will be towed up the Piscataqua River to Portsmouth, NH where she will pass through a cut in the railroad bridge, then move into a dredged canal through the Market Street roadway extension and then be put on a cradle and hauled up a marine railway ramp to her final resting place on dry land. There, she will be facing the sea -- in Albacore Park -- as a memorial to the submariners who sailed in Portsmouth-built boats and to the Portsmouth Naval Shipyard which has produced some of the finest of submarines in the U.S. Navy.

Portsmouth is one of the great names in submarine history and deserves the ALBACORE -- whose revolutionary design marked the beginning of a new era in submarine speed and mobility. Jane's Fighting Ships lists her underwater speed as 33 knots while some old hands brag that for short bursts she got as high as 37 knots. Her second skipper, VADM Jon Boyes, USN(Ret.) tells of how ALBACORE -- at times with Admiral Arleigh Burke at the joy-stick control of the maneuvering submarine -- was able to change depth so rapidly and turn inside of the turning circles of ASW destroyers

that they were unable to get in position to use their weapons even though ALBACORE was being easily tracked by the destroyers' sonars.

The idea for a new type of battery-driven submarine is credited to RADM "Swede" Momsen, USN, who in 1948 saw an opportunity to develop a submarine which was optimized for high underwater speed -- without compromises for surface operations. Under a program for a purely "target" submarine, Momsen was able to bring forth the best of David Taylor Model Basin ideas on how to achieve maximum speed in a submarine. Models of submarines resembling a "tear drop" or dolphin -- with the approximate length to breadth ratio and shape -- were tested in the Basin as well as in wind tunnels at the Langley Air Force Base, Virginia, and the shape of ALBACORE determined. Although originally funded as a target submarine, later funding was for an "engineering evaluation platform."

ALBACORE as originally designed and built at the Naval Shipyard, Portsmouth, -- and only modified slightly through her experimental years -- was 203' 10" long by 27' 1" in breadth, with a 7.5 : 1 length to breadth ratio when launched in August of 1953. Her standard displacement was 1242 tons and submerged displacement 1837 tons -- about the same as the "Fleet" boats of WW II. Her complement was 4 officers and 36 enlisted men. She had two GM "pancake" diesels, which, from the records, proved the only unreliable one of the many new features of the ALBACORE. She had a silver-zinc battery of about 3 times the power density of the lead-acid batteries of WW II vintage -- but the silver-zinc battery was about 10 times as costly as a lead-acid; $3 m versus $300 k. Later, however this battery was replaced by a 500-cell, lead-acid main storage battery of improved efficiency. ALBACORE was built at a cost of $5.5 million. In her original configuration, she had a single screw, driven by a 6,400 hp

motor. But this was soon changed to a contra-rotating, twin-propeller system with an inside drive shaft diameter of 15" and an outside shaft of 28" diameter -- driven by two armatures, of a 10' diameter GE main motor that weighed 95 tons and was 22' long from thrust bearing to thrust bearing. The forward propeller was 10' in diameter with 7 blades, while the after propeller had 6 blades and was 8' in diameter. Each propeller ran at 7500 hp per shaft ..... 15,000 hp in a submarine the size of a fleet boat! ALBACORE's original stern configuration had a single propeller surrounded by the rudder and stern plane control surfaces. In December, 1955, however, a conversion placed the propeller aft of X-configured control surfaces, while a small auxiliary rudder on the sail was removed.

There were other engineering ideas which were tested in ALBACORE before her retirement in the '70s: use of low level carbon steel in the hull, a single multi-purpose mast, noise reduction modifications, a concave bow sonar dome, a large dorsal rudder, dive brakes installed around the hull circumference, a towed sonar -- TOWFLEX, a vernier control system for precise positioning of the sub's control surfaces at high speed, and an emergency main ballast tank blow system.

ALBACORE set new world's submerged speed records for submarines and was the model for the nuclear submarine SKIPJACK -- the fastest nuclear submarine of the '60s. The Soviet's ALFA which makes 43+ knots also borrows from ALBACORE's hull shape.

All in all, ALBACORE should prove to be one of the most interesting tourist attraction in the United States while emphasizing the very important role played by the city of Portsmouth, NH in submarine history. The Portsmouth Submarine Memorial Association, a non-profit organization of which Joseph Sawtelle is the president, has the

ALBACORE tied up at the Portsmouth Naval Reserve Center -- awaiting the spring 1985 tides for final installation in Albacore Park, " a short distance from historic downtown Portsmouth's Market Square." The Association's goal is to raise $700,000 by the spring of '85 and hopes to raise this money by personal appeals to individuals and corporations to become "friends" of Albacore Park. (From information supplied by the ALBACORE Memorial Association)

DISCUSSIONS

RAPID VICTORY AT SEA

Supposing that you had just survived a serious case of pneumonia because you took massive doses of penicillin. Then you had to continue to take these pills until the offending germs were totally eradicated -- because germs can adapt to the effects of penicillin unless they are overwhelmed fast and totally.

Partial measures in curing disease are like today's partial measures against organized crime or what is advocated by some for war at sea -- they're not only the wrong measures but also the most costly ones.

Just as millions of germs might adapt in unpredictable ways over a long period of time to half measures, so nations of millions of people have adapted to an enemy threat during a prolonged war. This makes an extended war of half measures unpredictable, as was demonstrated by the war in Vietnam.

With the hope of the world's peoples resting on the continued success of the U.S. and her Allies, a victory in war must be predictable and hence the preparations for it must be designed to

ensure a rapid victory after the initiation of conflict.

The war most critical to the West will be that conducted at sea. We must thus plan to win at sea quickly. With the outcome of the war on land (in Europe, or Asia) determined largely by the success enjoyed at sea, the rapidity of winning becomes a key to the successful sea support of land operations. With the mobility of land armies even higher today than during Hitler's regime, a decision in the overall war is likely to occur in a matter of weeks if a significant advantage or victory at sea is quickly gained.

Nuclear wars are felt to be fast and short. Yet, the fact that the Soviets have achieved nuclear equivalence while continuing a conventional buildup, shows that they plan for war under the umbrella of the deterrent effect of nuclear weapons. Hence, the U.S. must plan for rapid victory in a conventional sea war -- without the use of tactical nuclear weapons.

So vital is sea traffic that it can be recognized how a rapid victory by the Soviets at sea would obviate any future need for continuing a land war. A NATO war could be suddenly finished -- with the European continent under Soviet control. In WW II, Hitler's rapid gains on land were invalidated by his loss of the sea war, as the Allies slowly adapted to the German submarine threat over a prolonged period of time. Similarly, Japan's effort directed towards a knockout blow to produce a rapid victory at sea failed. The germs adapted and killed the patient. It would be foolhardy to assume that the Soviets have neglected to learn this lesson.

So what are the implications and requirements for a rapid victory at sea today?

Rapid victory implies that sea war must

change from a series of episodic engagements to a massive, concentrated destruction process. This is made possible by global reconnaissance and the reach of global weapons. A massive attack on ships at sea has become practical, while ships which formerly enjoyed the havens of ports and hence were immune to rapid attack, can now be destroyed by missiles which can home in on individual ships in a port area. More obviously, ships in port are highly vulnerable to nuclear weapons used in area destruction -- but mutual deterrence of such weapons can be assumed. Sabotage has also been a way to get at ships in their port havens, but sabotage has never proved very reliable for rapid neutralization of large numbers of ships. Interestingly, the Argentines probably prolonged the Falklands War by taking their ships out of action, while the Germans in WW I more definitely stretched out that War by keeping their High Seas Fleet in the safe confines of a port.

Just as the increase in complexity of R & D programs, e.g. Polaris, required new planning and evaluation tools (PERT), so planning for a rapid sea war will require new approaches and new assumptions. Weapon design is impacted, but even more critically are the inventories of weapons. As a guess, to insure that a short war is possible, the total number of homing weapons for a given set of targets should be at least 3 times the number of targets. Thus, against 500 submarines there should be available at least 1500 homing weapons. For 2,000 merchant and warships there should be at least 6.000 antiship homing weapons, and the same ratio for aircraft delivered antiship weapons. Mine plants would need an even higher ratio of weapons to enemy targets.

Shortfalls in inventory provide tangible measures of risk. They are also more fatal to well laid plans.

Over a couple of decades, under the guise of economy, the U.S. has consistently short changed the production of weapons and vehicles. In effect, war planning has been predicated on a belief that the U.S. can produce the needed products after a war has started. But manpower and material shortages are likely to totally invalidate today's plans, while today's defense process has resulted in the destruction of a sub-tier of suppliers to the aerospace and shipbuilding industries. This adds to the difficulties in getting war industries into adequate war production. At the same time, stringent red-tape requirements and pricing policies have destroyed productivity incentives. We've seen that if only 8% of sales is invested in new plants and equipment by general U.S. industry, the result has been a loss of competitive position. Nevertheless, industry supporting the defense effort has been investing only 5% of its sales into capital improvements.

Since WW II the U.S. has become a have-not nation with respect to many critical materials. To plan for production of submarines and submarine weapons after the war has started is patently frought with risk. The best way to store critical materials is in the form of completed submarines and weapons. In fact, the industrial situation is now so perilous that it is not known whether a shift to a "war economy" in terms of personnel skills, plants, equipment or materials, is practical! It is ironic that the nation whose industry won WW II has been so mismanaged by improper accounting, taxation and other legislative provision that the U.S. is vulnerable to defeat by a nation which "cant even supply her own consumers."

In today's environment, the only way to make sure that the submarine force can do what is required in a war, is to do whatever needs doing before a war starts.

The cost of producing what will be required will be far less if done at a steady pace in peacetime than in the furious rush after a war has started ..... particularly since the loss of products is likely to be enormous if the war at sea is allowed to proceed as in WW II, when thousands of ships full of products went to the bottom.

Those who fear that a peacetime stocking of adequate numbers of weapons and vehicles would result in future paralyzing block obsolescence, fail to recognize that it's the electronic suites -- changes to which can be easily backfitted into both vehicles and weapons -- which will forestall this obsolescence problem. For example, B-52's have remained useful for several generations through such an updating. Further, accelerated operational training gradually uses up inventories while improving readiness.

War at sea is unique in that assets of the enemy are readily countable. Their location is also known and can be reached from the sea. Thus an enemy's navy and his merchant marine can be destroyed quickly, crushing the backbone of an enemy's war-making effort. Then the land campaign with its greater involvement with population, economies, governments and air-land forces can be more easily controlled.

CAPT R. B. Laning, USN(Ret.)

C^2T of the Antiship Tomahawk Missile

The two articles on command and control in this issue of the Submarine Review -- one by Phoenix, Soviet Submarine Command and Control, and one by Jon Boyes, C^2 and the Submarine as a System of Force -- suggest that a discussion might be

usefully pursued, within these pages, relative to command and control concepts for the newly deployed Tomahawk missile. And, since the targeting of Tomahawk for a mission is an essential element in the "control" of the weapon, the problem being addressed is a C^2T one, where C^2 is command and control and T is targeting.

Phoenix indicates how the Soviets argue, through open discussion, the command and control theory applicable to specific modes of warfare. Jon Boyes on the other hand indicates that U.S. command and control techniques appear to lag the introduction of new weapons.. Hence, although the total subject of C^2T for Tomahawk in its various versions -- antiship, land attack conventional, land attack nuclear -- might be covered, for purposes of simplification a focusing on how to employ just the antiship version of Tomahawk appears to be a good place to start.

The submarine-launched, antiship, long-range cruise missile -- TOMAHAWK -- is a weapon that should be usable at great ranges. Its firing platform, the SSN, is a highly covert, mobile means for concentrating a high level of force, in coordination with other submarines, against enemy surface targets -- with a good element of surprise. The Tomahawk's sea-hugging trajectory and its inherent quality of stealth due to low radar cross section and a range gate for actuating the terminal homing radar, insure the element of surprise. In fact, the combination of nuclear submarine and long range missile provide a new form of "artillery" at sea. How to profitably use this new submarine capability is not only a product of the "control" of this weapon but also how well it can be targeted out to very long ranges. For this discussion, an arbitrary distance of 200 miles is chosen in order to examine the C^2T problems associated with delivery of Tomahawk out to such a range against a surface target.

Targeting

Airborne sensors (satellite or aircraft) now provide good broad ocean surveillance (both visual and electronic) of surface ships on a world-wide basis. Satellites also provide the means to relay target information globally. Satellites, either Navstar or Transit, can also offer an accurate geographic positioning of ships on the oceans of the world. Environmental satellites and environmental ocean buoys supply the necessary information for assessing the effects of weather on target motion and on a missile's homing means.

Over-the-horizon radars now give good ocean coverage out to well over a thousand miles. While a horde of observers in fishing boats, merchant ships, commercial aircraft, watchers on the shore, etc. add to the wealth of information on ship targets.

Moreover, the sensors of an SSN are too short-ranged for detecting or tracking targets at great ranges -- as, for example, 200 miles. In fact, if the function of targeting is not carried out by external sources, Tomahawk as an antiship weapon is apparently only usable at ranges of under 50 miles. Furthermore, the organic collecting of surface target information forces an SSN into operating modes which are inimical to its effectiveness in its primary mission of ASW as well as reducing the submarine's covertness.

Philosophically, in war a weapon is always fired at a tracked target. More than one observation is invariably made before firing to determine whether the target has to be led or whether it is definitely stationary. Designing Tomahawk to be used against a "point" target has created a blind spot in thinking about long range targeting and the weapon control necessary to insure a hit. By firing Tomahawk at a "point"

target 200 miles away, the trajectory errors plus the size of the area generated by a target which is assumed to be freely evading in any direction, will be so great as to force Tomahawk into a terminal search mode to acquire the target. Doing that -- flying around in a search pattern with its homing radar activated -- both destroys the element of surprise and also makes Tomahawk far easier to be countermeasured or shot down. In fact, a detection of a surface target also needs a confirmation of identity. In the process, the additional target information to make this determination will usually permit a judgement as to the target's course and speed. In a worst situation where an ELINT satellite picks up an identifiable radar emanation from a specific warship which carries that radar, not only is the identity of the target determined but the satellite can identify its geographic position in real-time. Such a "point" target seems worth firing at, yet there will still be collateral intelligence to indicate where it might be heading and what its speed would likely be -- consistent with some mission on the ocean. How scanty tracking information can be, and still have a good basis for a Tomahawk hitting solution, can be illustrated. A coast watcher reports an enemy cruiser leaving port and passing a headland at one mile off, at a specific moment of time. The cruiser is also reported to be making high speed and to be headed in a northwest direction. A day later SOSUS reports a bearing on a high speed warship -- which could be the enemy cruiser. Two days later, an SSN operating in an area northwest of the headland mentioned in the coast watcher's report, picks up the noise of a big, high-speed warship. The SSN's CO then, without knowing the range to the warship, can launch a Tomahawk on a lead bearing to account for the target's speed and course as averaged by the two bearings -- two days apart. With the missile's terminal homing seeker activated all the way, the missile has a good chance of hitting the cruiser -- because of its

wide terminal sweep -- whether the range is 60, 120, or even 180 miles.

The main factor in targeting, then, is that the missile should be aimed at the spot where the target is estimated to be on the arrival of the missile. The uncorrected trajectory errors should then -- at 200 miles -- not be so additive as to place the missile outside the area swept by the missile's terminal homing radar or IR seeker.

Control

"Control" of the antiship Tomahawk against surface targets at great range apparently involves two separate functions: (1) the fire control of the weapon at launch and in flight; and (2) the control of how the weapon is to be used. In the first case, the CO of an SSN ensures the fire control of Tomahawk. In the second, the CO might also control the use of Tomahawk, as for example, when an SSN is on independent operations and receives real-time targeting information directly from external sources such as an aircraft or satellite. Still, the political implications of attacking a target 200 miles away which may not be clearly identified, along with the possibility of inadvertently hitting wrong targets, militates against a CO being allowed to carry out the "control" function. Additionally, for long range attacks, the amount of information necessary to identify the target, be aware of intervening ships and obstructions, have the strategic picture for estimating the target's motions, and know the command restrictions, is not easily attained by an SSN on its primary mission of antisubmarine warfare. In this operating mode, insuring reception of the necessary information both tends to compromise the SSN's covertness as well as affect its ASW efficiency. Hence, the means for effective control seem better located at a remote position, external to the SSN. The introduction of the the Outlaw Shark information-collating and

displaying system to submarines, suggests that the SSN in war can adequately do its "artillery" job organically. But it cannot, for more reasons than the difficulties an SSN would have in getting the necessary data. In order to "control" the coordinated Tomahawk firing by several submarines against a hard, major enemy target or a grouping of enemy ships, the control source should necessarily be external to any of the SSNs involved. This should minimize communications emanating from a submarine -- which otherwise would compromise surprise and allow enemy EW efforts to neutralize the attack and put the communicating submarine at hazard. The need for concentrating the force of several submarines against certain kinds of enemy targets is self evident, both to overwhelm enemy defenses through the near-simultaneous attack of more than one or two weapons, as well as to insure a significant level of damage created -- allowing for an efficient follow-up against the crippled targets with torpedo attacks.

"Control" by a command afloat is argued. Yet afloat commands carrying out the function of coordinating submarine "artillery" are more susceptible to enemy EW efforts. (The emphasis placed by the Soviets on damaging an enemy's control systems to insure the successful use of their own C^3 system is noted in Phoenix's article.) Also, when an SSN is operating in support of battle groups, its use of Tomahawk antiship missiles is improbable. (The land attack version, however, is likely to be used.) In the support mission, ASW only would be required since surface targets are more feasibly taken under missile attack by escorting warships and aircraft. If damage assessment seems needed in order to initiate further actions, then a shore based command can best call-up the resources necessary to do the job. This can mean diverting a surveillance satellite over the scene of action or laying on an aircraft mission, etc.

"Control", it needs to be emphasized, should be carried out by experienced submarine personnel. There is much that is unique about submarine operations which require a special understanding of the control problems involved with use of Tomahawk from SSNs and the coordinating of Tomahawk-armed SSNs in concentrated weapon attack.

Command

For the singular situation of an independently operating submarine detecting and attacking a surface-target-of-opportunity, command responsibility for such an operation should still be vested in a senior submarine commander -- who has established, through his published doctrine, the freedom for a CO of a submarine to act on such opportunities. Normally, the function of "command" for most independent submarine operations should be in the hands of a senior shore-based submarine commander -- COMSUBLANT, COMSUBPAC, COMSUBSMED, etc. For carrying out major fleet operations, including attack against an enemy's fleet of surface warships, command should normally be exercised by a U.S. fleet commander -- who is best shore-based for a major operation.

Summary

Though this discussion is simplistic in many of its facets, it does raise many debatable points.. These can seemingly be ironed out through a discussion of the theory behind the concepts for C^2T. With little knowledge of what the submarine force has in place to handle this problem, it still seems reasonable to recommend that, for example, COMSUBLANT carry out the "control" function for coordinating the use of the antiship Tomahawk against surface targets and do it with: a greatly expanded Outlaw Shark type of system; an

established network of redundant communications for data and intelligence collection and dissemination of directions to SSNs; a staff which utilizes computer aids and which is trained for rapid development of plans in order to respond to opportunities presented by the enemy under conditions most favorable for the SSNs. Also, it devolves upon COMSUBLANT to do the targeting function through a collation and synthesis of all available data generated on a surface target -- by sensors external to the missile-carrying SSN. Any target information gained organically by the SSN, should, by doctrine, be used to improve the fire control solution -- which is the CO's control function.

W.J.R.

PERSONNEL NOTES

o The recent selection for Commodore includes six Captains who are submariners. There were thirty line officers on this selection list, plus six more special duty officers. The six submarine Captains selected and their present jobs are:

CAPT Henry G. Chiles, Jr.
(COMSUBRON THREE, in San Diego)
CAPT Thomas W. Evans
(Deputy Director SSPO, PM1)
CAPT Dwaine O. Griffith
(Director of Deep Submergence Programs, OP 23)
CAPT Virgil L. Hill, Jr.
(COMSUBRON TWELVE, New London)
CAPT Wayne E. Rickman
(Special Assistant for the Naval Nuclear Propulsion Program)
CAPT Larry G. Vogt
(COMSUBLANT Chief of Staff)

o Submarine Flag Officer moves include:

Commodore Ronald M. Eytchison - from Director Attack Submarine Division (OP-22) to Commander Submarine Group 8

Commodore Charles H. Brickell, Jr. - from Joint Chief of Staff (Deputy Director NMCC) to Director, Undersea and Strategic Warfare & Nuclear Energy Development Division (OP-981)

Commodore J. Guy Reynolds - from Defense Intelligence Agency to Director, Attack Submarine Division (OP-22)

Commodore Stanley E. Bump - from Executive Assistant to Chief of Naval Material to Assistant VCNO/Director of Naval Administration (OP-09B)

Commodore John M. Kersh - from Chief of Staff SUBLANT to Commander Field Command DNA

Commodore Michael C. Colley - from Commander Submarine Squadron 2 to Director, Human Resources Management Division (OP-15)

o Recent retirements of Submarine Flag Officers:

Rear Admiral Paul D. Tomb (1 Oct.)
Rear Admiral Frederick W. Kelley (1 Nov.)

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o Excerpted from an AP news release of 27 November: VADM Kauderer, COMSUBLANT, in a recent interview notes that, "Better pay and more time ashore are checking the erosion of the Navy's submarine officers. Five years ago", he says, "the submarine force could retain only 33% of its officers past their obligation of about five years....but the figure has risen to 47% and appears to be increasing by 3 to 4% annually. In

the enlisted rates five years ago, the submarine force held on to 62% of their third-term career petty officers and chiefs. Today the figure is 81%." Back to the officers: "Ten years ago we had such a poor retention rate we were losing people to civilian industry as fast as we got them. So competition for command right now is fairly small." The AP release also quotes VADM Kauderer: "Today's skipper of a Los Angeles-class attack submarine, usually a commander, earns about $61,000 annually....which includes basic pay, command responsibility pay, sea pay, and a nuclear power bonus.

NSL EDUCATIONAL FILMS

The NSL has obtained for our members the use of several good 16 MM films in support of our educational objectives. These films have been selected for use with audiences which have little exposure to the U.S. Naval Submarine Service or have not been able to stay current on our newer weapon systems. They are mailed in an approved reuseable shipping package which after use needs only to be left in any U.S. Postal mail drop.

We ask that you time your requests so that the film is mailed about two (2) weeks before use and returned immediately thereafter. A short questionaire is included with each film. Your responses will determine our future approach in providing educational films.

The films are available by writing the NSL or calling Pat Lewis at (703) 256-0891.

FORTY-ONE FOR FREEDOM (29 minutes)

Discusses the initial concept and rationale for a ballistic missile submarine. Portrays the effort to design, test, and operate the Polaris missile system. The film ends with the launching

and deployment of WILL ROGERS (last of Polaris submarines). A fine historical overview of initial FBM development, this film is suitable for an audience interested in how the SSBN force was conceived and developed.

ELITE FORCE (14 1/2 minutes)

Mr. Charlton Heston describes the opportunities that are available to qualified college students and graduates in the Navy's Nuclear Propulsion Officer Candidate program. (This is a recruiter oriented film.)

PRIDE RUNS DEEP (28 1/2 minutes)

Story of the Navy's Submarine Force. Excellent photography. Provides the audience with a close-up look of the crew in action aboard an FBM submarine. This film conveys the deep sense of pride that is shared by all submariners.

THE CHALLENGE IS MET (26 minutes)

Describes the conversion of twelve Poseidon submarines to carry the Trident 1 missile. Discusses the necessity for the Trident submarine and follows missile development and ship construction through R & D. Follows USS OHIO through initial upkeep at Bangor, Washington, and ends with Trident on patrol. This film contains great shots of missile launches.

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o From Commodore Stan Catola, CSG-6, comes a note telling how members of the Naval Submarine League can witness an SSBN launch of a ballistic missile during an SSBN's "demonstration and shakedown operation off Cape Canaveral..... "A surface ship accompanies the submarine to sea on the day of the missile launch -- leaving early in the morning and returning to port late that night. If space permits, visitors are invited to ride on this support ship. To get on the waiting list and obtain more details of this opportunity, call the Navy Office at Port Canaveral, (305) 853-7951."

This map shows some of the United States submarines that are preserved and are open to the public .

1. USS Bowfin, Honolulu, Hawaii
2. USS Pampanito, San Francisco
3. USS Marlin , Omaha, Nebraska
4. USS Batfish, Muscogee, Oklahoma
5. USS Cavalla , Galveston, Texas
6. USS Drum , Mobile, Alabama
7. USS Requin, Tampa, Florida
8. USS Clamagore, Charleston, S.C.
9. USS Torsk, Baltimore, Maryland
10. USS Becuna, Philadelphia, Pa.
11. USS Ling, Hackensack, N.J.
12. USS Croaker, Groton, Conn.
13. USS USS Lionfish, Fall River, Mass.
14. USS Cod, Cleveland , Ohio
15. USS Silversides , Chicago, Ill.
    U-505, Chicago , Ill.
16. USS Cobia , Manitowoc , Wisconsin

The map and submarine locations are taken from EBENEZER'S ATLAS , January 1982/ COBBLESTONE

SOME VIEWS OF SUBMARINES AND SUBMARINERS FROM THE BRIDGE OF A BIRD FARM

As a dedicated tail hook aviator, I want to say some nice things about submarines, submariners, and the Submarine League - and I want to ask some questions. But as a preface, I must firmly declare that anything I say is NOT to be construed as being against the 90,000 ton NIMITZ class aircraft carrier. That is a wonderful weapons system, that will be around for many years to come, despite the ever increasing capabilities and dramatic potential of the submarine. The NIMITZ class carrier, the AEGIS weapons system, and the nuclear attack submarine, all operating separately or together under the strategic umbrella of the SLBM force, is what distinguishes the U.S. Navy from all of the other Navies of the world. The United States is fortunate to have such a Navy in being and any who have contributed can feel proud of their efforts. I like the NIMITZ, I like AEGIS, and I like nuclear submarines. I am not about to abandon my admiration for any of the three.

First, about the Submarine League. I offer my sincere congratulations to the founders and those carrying out the mission of the League. The "silent service" has had good reason for keeping silent, but there comes a time when full exploitation of the existing and potential capabilities must be understood by some outside the closed, silent fraternity. Friendship and support come from understanding - and understanding comes from knowledge. In my opinion, the League is providing the knowledge for understanding and must be gaining friends for the submarine community in ever increasing numbers. The SUBMARINE REVIEW is the only professional journal I read from cover to cover - and I have done so since publication of the first issue. I

hope it continues in its present format, ie, stickman drawings, no commercials, and no politics....a truly professional journal.

Further, I am happy that the League decided to open its membership, including attendance at the annual symposia, to individuals who have never been active members of the submarine fraternity. I hope that policy will be expanded, with some concentration on increasing membership and attendance at symposia by representatives from all warfare specialities, particularly people from the active duty Navy. A goal that some would endorse is a joint convention/symposia of the Submarine League and the Association of Naval Aviation. Also, if and when the surface warfare community gets their "league" together, that league should be included, and probably act as the focal point for all. Since it seems to be an established fact that ships plying the surface of the ocean are going to be essential to the survival of our nation, guaranteeing the freedom of such activity should be the focal point of professional discussions on naval matters. I believe there are many who, while applauding the competition between warfare communities as being healthy for advancing the capabilities of a single community, also abhor the degree to which parochial competition tends to stifle the growth of overall naval capability. By following its broad charter amd membership policy, the League can be particularly helpful in breaking down some of the most impenetrable barriers of the past. Again, my sincere congratulations!

Next, on the subject of submarines. My appreciation of the strategic value of the SSBN came early as I was on the first plane that landed in Omaha at SAC Headquarters in 1960, to work with others on the joint preparation of the first Single Integrated Operational Plan (SIOP), which included the first targeting of Polaris. A subsequent tour as the Deputy Director of the targeting staff in Omaha enhanced that

appreciation of the SLBM. Then, under the tutelage and most cooperative attitude of the great Dennis Wilkinson, while I served as the Commander, Second Fleet, I began to get a much better appreciation of the value of the nuclear attack submarine. That appreciation expanded greatly with continued guidance from Pat Hannafin, a couple of fine staff officers, and the commanding officers of some attack submarines, during my stint as the Commander of the Sixth Fleet. Since that time, I have attended several symposia, listened to many experts, and been stimulated by the SUBMARINE REVIEW. I have reached the point where I think I am about qualified to ask some questions. The REVIEW seems like a logical place to pose those questions and I do so, with the objective of learning more and helping to stimulate more thought and discussion about a very important element of our Navy.

About the SLBM force:

+ In retrospect, did we really need the full 41 Polaris/Poseidon submarine program? Couldn't we have made more than a substantial contribution to deterrence with a smaller force? Is it necessary to go for the total TRIDENT program as now envisioned? Does the country really need the hard target kill capability proposed with the D-5 missile? Isn't the SLBM the hardest target to kill particularly when compared to an ICBM? Isn't a high confidence counterforce capability impossible to achieve, until the ASW problem is solved? Shouldn't we therefore be putting more of our effort on ASW if we really want a hard target kill capability? Shouldn't we be supporting more of the defensive initiatives of the President, backing off from some of the offensive systems which are now going to soak up a lot of money? Wouldn't even a delayed TRIDENT program, particularly with the D-5 missile, provide plenty of offensive power, thereby enabling the country to abandon the MX program? Shouldn't some

professional articles and views be published on that point? As Yogi Kaufman stated at a recent symposium, he's ready to contest some of the other legs of the TRIAD, in view of the great capability provided by TRIDENT. Is that too political an issue for professional strategic submariners to take on as a project?

On nuclear attack submarines:

+ What is so magical about 100 SSNs? Shouldn't there be more? Wouldn't the admirals on active duty support such action, if allowed to consider the issue in a purely professional atmosphere, void of political considerations? I recall writing a message from the Sixth Fleet over twelve years ago, setting forth a requirement for at least 13 or 14 SSNs in the Mediterranean, in peacetime. With the increasing capabilities of that system, is 100 really the right number? Shouldn't it be a lot more?

+ Do professional submariners really support the idea of the SSN functioning as a major contributor to the ASW element in the carrier Battle Group? Or are they just giving lip service to a requirement, really preferring to go off by themselves and do their thing in the traditional independent duty mode of operation?

+ How about potential? Doesn't PHOENIX (whoever that is) have a point in his (her?) article on "potential" in the October issue of the REVIEW? While there is some indication that PHOENIX suggests replacing aircraft carriers with nuclear powered submarines, (an ill advised concept in my opinion), I am sympathetic to the idea that we may not be exploiting the full capability of the nuclear attack submarine. Isn't there a potential for the SSN to be an advance battle element in a fight - the lead force - not just a scout? I have to confess that when I consider taking a large carrier task force to

combat in the North Atlantic, - or anywhere - I know I would feel much more comfortable if preceded by an armada of attack submarines, properly armed and turned loose to exploit their capabilities.

+ What about types and missions? I really got turned on by Dick Laning's article in the October REVIEW, discussing the many missions that could be accomplished by the old Polaris boats. To a student of how to fight in some of the remote areas of the world, the missions Laning discusses make a lot of sense. How do other professional submariners feel about his views - old Polaris/Poseidon boats serving as launch platforms for massive numbers of cruise missiles or torpedoes (in lieu of the battleship?); covert laying of sensor systems, net systems, mines; serving as early warning devices against low flyers; anti-air warfare platforms; covert logistic support vehicles; and so forth? I should think the Marines would be particularly intrigued with a submarine that had the capability to covertly transport a large number of fully equipped troops to a scene of special action. Further, many naval aviators have been intrigued for years with the idea of a submarine with aviation capability....previously discussed in the REVIEW, and once again mentioned in the October issue.. The story of the Japanese submarine/air capabilities in World War II are fascinating. What has prevented us from developing that same kind of capability?

+ What about size? Should all attack submarines be as big as the SSN 688? Do submariners ever think about small tactical subs fighting under the seas - the undersea version of the fighter pilot's dog fight? The big buzz words with aviators are "air superiority". Don't we need "undersea superiority"? and wouldn't a stable of small fighter subs fit in that mission? Wouldn't they be cheaper, easier to build, and

thereby more numerous - adding a large dimension to the kill capability (P_k) against the total threat....as opposed to the ^kP_k against a single opponent? (Just asking).

Finally, about submariners. From the bridge of a carrier or any other platform, one has to be impressed with the talent and accomplishments of those wearing dolphins. For one thing, their sea stories equal any hangar flying tales the tailhookers can concoct...especially at the bar. In fact, sometimes one is a bit intimidated by the quality of the talent. Beginning with Admiral Rickover's injection into the selection process for people entering the nuclear power program, there can be little question that the submarine force has enjoyed a "pick of the litter" situation....only the best. Watching some of that talent depart the Navy rolls after relatively short periods of service can cause some concern. One wonders if the Navy is really getting the maximum benefit. Is the very restrictive nature of the submarine fraternity, the healthiest environment for the Navy overall? Are those high walls and many wickets that must be passed to make it in the submarine community also acting as barriers that keep the inmates from broadening their experiences in the outside world? Is the Navy getting the maximum from the talent....or is that talent being required to be so completely dedicated to submarines that it sometimes experiences early burnout? Some of the most interesting and effective naval officers in the aviation community were those tailhookers who wore dolphins before they earned their wings. And there have certainly been some outstanding surface warfare sailors who spent several years in the dolphin world prior to their surface ship duties.. Names like Train and Bigley come to mind....not to mention the ultimate example, Jim Watkins. Is there effort in the submarine community to have their talented people injected into other communities - in order to broaden their own

experience and enable them to do more for the overall Navy, not just the submarine force?

In summary and conclusion, I like submarines, submariners and the Submarine League. That doesn't mean I am ready to see a periscope in the cockpit of every tailhook aircraft, but I am impressed. And once again, I offer my sincere congratulations to the founders of the League and the implementers of its policies. An open forum, dedicated to submarine warfare has long been needed. It is a pleasure to find a medium where questions can be posed to the submarine professionals....with admiration and respect for all they have accomplished....and will continue to accomplish in the future.

Jerry Miller

IN THE NEWS

o On Dec. 8th at the launching of the USS PITTSBURGH (SSN 720) three collateral descendents of John Holland, designer and builder of what is considered to be "the first submarine" of today's line of submarines, were part of the launching activities. Vincent, Edward and Thomas Clifford, the great grandsons of the inventor's sister Ellen Holland McCaffrey, assisted in the christening ceremony, prior to the launching. The PITTSBURGH was launched at General Dynamics' Electric Boat Co. and was sponsored by Mrs. Carol Sawyer, the wife of Hon. George A. Sawyer who was the speaker at the launching ceremony.

o Other launchings and commissionings of U.S. submarines include: the ALASKA (SSBN 732) was launched on 12 January with the main speaker, Senator Stevens of Alaska, and sponsor, Mrs. Catherine Stevens: the AUGUSTA (SSN 710) was commissioned at Kittery, Maine, on 19 January, 1985, sponsored by Mrs. Diana S. Cohen.

o In Underwater System Design, June/July 1984 edition, a small item tells of a joint Canada-France venture to develop a nuclear powered submarine work system. "The submarine will be capable of deploying a range of mission specific Remotely Operated Vehicles (ROVs) as well as support saturation diver lockout operations -- for 30 days or longer if required, including in ice covered waters."

o Janes Defense Weekly of 15 Sept., 1984, reports that Soviet midget submarines have recently been operating within Japanese Territorial waters. "Tracks identical to those found in Swedish territorial waters have been discovered on the sea bed within 3 nm of the Hokkaido coast in the Soya and Tsugaru straits.... It is estimated that the midget submersibles are about 5 meters long and have a crew of between 2 and 4."

o Janes Defense Weekly of 8 Sept. shows a photo of the new "Sierra" SSN and gives the characteristics of the Soviet sub as "a submerged displacement of 6,500 tons, an overall length of 105 meters and a beam of 11 meters....with twin reactors reputed to drive her at 32 knots under water." This article further states that: "Although U.S. opinion thinks that the faired housing on top of the rudder fin may house a towed sonar array, Norwegian experts suggest that it might be a towed decoy for use against homing torpedoes. This would be useful when passing through NATO ASW barriers, when they would face Captor mines as well as air and ship-launched homing torpedoes."

o The Washington Post of Sept.22 tells of a collision between a Victor-class Soviet submarine and a Soviet merchant ship in the Straits of Gibraltar. The sub "with a badly damaged bow" left the scene, "steaming slowly on the surface"

while the merchant ship was "in distress and possibly sinking." At about the same time, the Post notes, "a Los Angeles class submarine, the JACKSONVILLE, collided with a 270-foot Navy barge while steaming on the surface toward port at about 5 a.m." The collision which caused only "minor damage" to the sub and barge occurred off the coast of Norfolk, Va. A third submarine incident was, according to the Post, reported by the Japanese Defense Agency. "A Soviet submarine in distress and possibly on fire was spotted in the Sea of Japan....A military plane had flown over the Golf II-class ballistic-missile submarine and white smoke was observed pouring from the submarine, while a Soviet surface ship was seen transferring water to the sub, apparently to put out the fire... The submarine later submerged."

o The Hongkong Standard of Sept.23, reported that on the following day "the ballistic missile submarine was observed 'drifting' in the same area (75 kilometers northwest of Okinoshima -- off Honshu) after apparently heading north then turning around. At this time, the submarine had no smoke visible and was accompanied by a Soviet support tanker and two tug boats. Shortly after the submarine had returned to the area 'spewing smoke'...a tug boat sprayed the submarine with water, and the smoke disappeared." It was "speculated that the submarine was damaged by fire and that if it had not been extinguished, its nuclear missile could have been damaged inadvertently" but that "a safety device would have prevented a nuclear explosion."

o Defense Week of Oct. 1, reports that Mr. Gerald Cann at an NSIA conference "told the NSIA executives that the class of subs to follow the SSN-21 could have a double hull, much like modern Soviet subs. A double hull" he said, "quiets the boat and increases the ship's survivability, particularly against lightweight torpedoes which cannot penetrate two hulls and the water between."

o Navy News and Underseas Technology of Dec. 7th notes that the Naval Audio Visual Command in Washington is seeking a design for a new submarine periscope closed circuit television. "The design objective is optimum tactical and reconnaissance imagery, using solid state sensors with existing periscope optics as the primary image forming lens system."

o An AP release dated Dec. 9 tells of an Iraqui Air Force warplane attack on a 163,155-ton Bahamian-registered oil tanker, using an Exocet missile. The Captain of the ship reported that damage to his vessel was "negligible", the missile ignited no fire and none of the 32 crew aboard was injured. Exocets with their 360-pound HE warheads have since January 1984 in the Iraq-Iran War, damaged several dozen large ships without sinking any. (Ed.Note: These results are of interest since some submarines are now fitted to fire the submerged launched Exocet while other submarines can now use Harpoon with its somewhat larger 507-pound high explosive warhead.)

o NAVOP 144/84 of 1 Dec. announces the awarding of contracts for four nuclear attack submarines. Newport News Shipbuilding was awarded three, totaling $779,400.00 while General Dynamics Corporation's Electric Boat Division was awarded one, at $282,900.00.

BOOK REVIEWS

U-Boat Commander: A Periscope View of the Battle of the Atlantic by Peter Cremer in collaboration with Fritz Brustat-Naval: Annapolis 1984; Naval Institute Press; 244 pp.

"All is as good as life insurance." That was the boast of the crew of U-333 commanded by Peter

"Ali" Cremer. They boasted with good reason. To quote the translator's preface to "U-Boat Commander": "Towards the end of 1943 the British Admiralty's Operational Intelligence Centre produced a breakdown of German U-Boat commanders according to the length of time they had served. The list then comprised 168 officers. Fifty had served for less than three months. All but sixteen for less than sixteen months, and only one for more than twenty-five months. That one was Peter Cremer . By the time of the Allied Invasion in June, 1944, among all the officers who had served with him since his first patrol in May, 1941, only one survived. Cremer himself was the only U-Boat Commander to have sailed from German bases in western France since that year and lived to tell of it. Such were the casualties suffered by the men of the German U-Boats, such the toughness of their war."

For that reason alone we are fortunate to have in this book his account of how he did it. We are even more fortunate that the book appears to be thoroughly researched. Cremer and his collaborator studied extensively in logs and battle reports and quote them throughout the book as well as quotes from many of the adversaries he met during his patrols. Anyone who has written or critically examined logs, patrol reports, war diaries and action reports realizes that they are written with a view to putting the best possible interpretation on the facts as the author saw them. None the less, they are the best and most objective sources that we have at this late date and Cremer's extensive use of them lends authenticity to his remarkable story.

The story is really two stories which run in parallel veins throughout the book. The first is the story of "Ali" Cremer and his adventures in U-333; the second is his interpretation of the strategic and tactical conduct, by both sides, of the Battle of the Atlantic. Peter Cremer is well

qualified in both areas.

Peter Cremer entered naval officer training in 1932 at age 18, graduating six years later. He was of mixed ancestry, born in Lorraine to a German lawyer and a French mother. His father's mother was the daughter of a Royal Navy Officer, but over his bed as a child was the motto, "Never forget that you are a German." Following graduation he served for two years in the DD Theodor Reidel as a deck watch and gunnery officer, participating in combat operations and the invasion of Norway. In June, 1940, he was personally selected by CinC, Submarines, Captain/Commodore Donitz for submarine duty. There followed six months of submarine training after which he went as the Commanding Officer of a new coastal submarine U-152. His training to this point parallels that of a U.S. Navy submariner except that he went directly from school to command and did not serve an apprenticeship as a watch officer and department head. In July, 1941, he was ordered to command the new construction, Type VIIC submarine U-333.

Between July, 1941, and June, 1944, Cremer made 8 patrols in command of U-333. On his first patrol off Newfoundland he sank three unescorted merchantmen. However, he also sank the German blockade runner, "Spreewald" my mistake. Tried by court martial he was acquitted when Hessler, Donitz's son-in-law, proved that "Spreewald" was at fault. On the second patrol he was bombed and severely damaged by a radar-equipped aircraft and then rammed by an AVGAS tanker on which he was making a periscope depth night attack. Despite the damage he continued to the Florida coast and patrolled close inshore off Vero Beach. He sank two tankers and a freighter, all singles, but the ASW forces caught him in shallow water and gave him a thorough pasting. After return to France the boat required a 77 day refit. On the third patrol, carrying the Biscay Cross radar intercept set, he was assigned as wing man in a 7-boat Wolf

Pack. Attacking a convoy, he was unable to penetrate the screen and was hounded and damaged by HF/DF equipped escorts. With engine and shaft trouble he aborted the patrol after less than two weeks. On the fourth patrol, off Sierra Leone, he was jumped by a corvette which rammed him twice and he was severely wounded by gunfire. Rendezvous with a Milch Cow submarine with a doctor saved his life and provided a relief skipper to bring the boat home.

There followed a six months period of hospitalization and service on Admiral Donitz' staff, during which another commander took over U-333 and Cremer was given an opportunity to observe how the submarine battle was run from headquarters. At Donitz' personal request he resumed command of U-333 in June, 1943. He was one of three "experienced" skippers chosen to find what had happened during the disastrous "black May" 1943 when 49 U-Boats were lost. He was the only one of the three to survive. His 5th (U-333's 7th) patrol lasted ninety days and was conducted south of the Azores. During the patrol he was resupplied three times by Milch Cow or operational submarines and at the end of the patrol seven U-Boats were immobile in the Atlantic waiting for refueling. The patrol was not productive.

On the sixth patrol he carried the NAXOS radar intercept set which was effective against 10 cm radar, and 4 GNAT acoustic-homing anti-escort torpedoes. He fired a GNAT at a destroyer and claimed a hit but it was determined that the torpedo exploded prematurely in the wake. Finding himself directly in front of a heavily escorted 66 ship convoy he attempted to penetrate at periscope depth. He was bombed and rammed by a frigate and was severely damaged again without getting off a shot. The seventh patrol, in which he furnished target services for a H/K group off the Western Approaches, and the 8th patrol opposing the

landings in Normandy were also non-productive.

Following the 8th patrol, Cremer, with "more than half of his people", was transferred to the new-construction, Type XXI, "electro boat" U-2519. The new C.O. of U-333 brought his "own people" also but the U-333 was lost on the next patrol. Before it could get out on patrol U-2519 was damaged in dry dock. Cremer and his crew were then pressed into service as infantrymen in the defense of Hamburg. Still in Army uniform, they were designated as Donitz' personal bodyguard at his headquarters, first CinC Navy and later, surrogate Chief of State after Hitler and throughout the surrender negotiations. Cremer managed to avoid becoming a prisoner of war and became a private citizen.

It is remarkable how Cremer seems to have been able to observe so many notable events in WW II. His close association with Donitz provided background for his observations on German strategy and the conduct of the war. He mentions Hitler's early emphasis on surface ships, his decision to cut off R&D effort after the fall of France and his earlier chasing of scientists over to the enemy side for either racial or political reasons. Cremer's sinking of a blockade runner calls up a discussion of the plight of overseas German shipping early in the war. He claims that U-333 was shot at by the HMS GRAPH, a German Type VIIC submarine captured by the British and recommissioned in the Royal Navy, and discusses the conduct of German prisoners of war. He mentions sighting a Japanese submarine off La Pallice and then comments on Japanese reluctance to alienate the Russians. The patrol off the Florida coast produces a chapter on the unpreparedness of the U.S. in 1942. There is no reason to doubt the authenticity of these encounters and the book is enriched by Cremer's observations on them.

As far as U-Boat tactics are concerned Cremer gives very little detail. His attacks were on singles which he closed to very short ranges. Although Cremer mentions difficulties with the magnetic exploder and torpedo depth control early in the war, except for the GNAT, his torpedoes performed properly and his fire control was adequate. The Wolf Pack tactics consisted of massing submarines in specified grid positions along a convoy track and then turning them loose to attack individually. He mentions no communications between boats and no Pack commander. This contrasts with the U.S. submarine coordinated attack units in the latter stages of the war in the Pacific. The Germans were not very successful, and Cremer infers that many boats were reluctant to penetrate the screen. The boats were on the surface much of the time and in frequent communication with headquarters. The Allies' escort forces with airborne radar and HF/DF murdered them. Cremer's attempt to penetrate a screen from ahead at periscope depth was disastrous. He seems to have put little weight on sonar information and sonar is rarely mentioned except in depth charge attacks. Although the boat was deep-diving (250 meters) he does not mention the use of thermal layers to foil sonar detection.

Cremer's discussion of the efficiency of airborne radar and HF/DF runs through the book. The Germans first thought airborne radar was not possible. When proved wrong, a search receiver was developed covering the 1.4 to 1.8 meter band. The equipment had to be disassembled before the U-Boat could dive and was considered by the skippers as useless. When the Allies changed to 10 cm radar the Germans were slow to counter as they were to a further shift to 3 cm. The Germans did not believe until after the war that HF/DF was tactically effective and continued high volume radio traffic from the boats at sea. Cremer notes sadly that many boats were lost because of these deficiencies. In the latter stages of the war,

boats were not permitted on the surface in the Bay of Biscay at night because of the Allies' A/C radar and search lights. They charged their submarine batteries in daylight. The need for the snorkel is obvious. The U-Boats carried a 3.7cm and 20mm guns and shot down a number of ASW aircraft. The decision whether to dive or fight back is a tricky one and Cremer indicates that he usually gave the order to dive. (At one point he says he opened the vents and closed the hatch.) A reluctance to dive or a hesitant decision may also account for many of the losses.

On the other hand, the Type VIIC, U-333, was a remarkably capable fighting submarine, sturdy, seaworthy, reasonably fast and deep diving. She carried 14 torpedoes and was designed to operate in the approaches to the British Isles. When forced to operate in more distant areas, resort had to be made to replenishment at sea even though fresh water tanks were converted to fuel and stores were carried in the bunks and in the head. U-333 was bombed and heavily depth charged and rammed on three separate patrols. That her damage control parties were able to patch her up and bring her home testifies to the toughness of the boat and the capability of the crew. The original crew, trained in mid-1941, remained with U-333 as long as Cremer did. This contrasts with the U.S. practice of taking trained men (up to one third of the crew) from the operating boats to form the nucleus of new construction crews. One wonders how many of the boats in the tremendously expanded U-Boat force after 1941 had crews as good as U-333. Cremer, himself, admits that the newer commanders were partially trained. "Ali" Cremer was as "good as life insurance" but he can probably thank the personnel policy that permitted him to keep his well-trained crew with him, more than his undoubted good luck in surviving.

Cremer is high in his praise of the Type XXI "electro boat" and believes that if it could have

been brought into operation earlier it would have turned the tide of the Atlantic battle and prolonged the war. The U.S. operated the Type XXI, U-2513, ("Jug" Casler C.O.) for more than a year after the war. There is no doubt that it was a quantum improvement over the submarines, U.S. or German, which fought in World War II and it sparked the U.S. "Guppy" conversions in the late 40's.

"U-Boat Commander" is a truly engrossing book and should be interesting to all naval officers, particularly to those who fought the Battle of the Atlantic on the ASW side. After his second patrol, Cremer sank no allied shipping but his battle with the ASW forces is of epic stature. There is very little technical detail and where it appears it should not be scrutinized too closely. For example Cremer fired a spread of steam torpedoes at a tanker from 400 meters. He says that the tanker saw the tracks, turned towards and combed the spread. With a 44 knot torpedo at 400 meters the running time is less that half a minute and the tanker reaction is most unlikely. On the same patrol he sank a ship 85 miles from New Foundland on 24 January and seven days later sank the "Spreewald" in the Bay of Biscay with no discussion of how he got there. However, since he quotes survivors of the first sinking and was courtmartialed for the second, it is obvious that they did occur. This patrol report leaves 4 of his 14 torpedoes not accounted for. No doubt much else would not stand meticulous scrutiny.

However, it must be remembered that Cremer is writing for the general public and the book is not intended as a technical treatise on submarining for submariners. He writes 40 years after the events with a German collaborator and an English translator, both of whom are interested in telling a good story that the public will buy. It is hard, sometimes, to determine how much of the book is Cremer and how much is fashioned from extensive

research in old reports. We must also keep in mind that Peter Cremer was trained as a U-Boat Commander, not a submarine officer. But "Ali" Cremer, himself, is real. He is a lone survivor of a cataclysmic battle that virtually wiped out the German submarine service and he tells a fantastic story.

Years ago there was a radio comedian called Baron Munchausen who told outrageously unbelievable stories. When questioned by his incredulous listeners he would reply, "Vas you dere, Sharlie?" Peter "Ali" Cremer "vas dere".

Frank Walker, Jr .

PIGBOAT 39: AN AMERICAN SUB GOES TO WAR by Bobette Gugliotta, the University Press of Kentucky, Lexington, Kentucky, 40506 (1984)

The title tells you that this is the story of the S-39. But this excellent and well-researched book is much more than that; it lets you see that long-vanished, colorful Navy institution, the Asiatic Fleet Submarine Force. And throughout, it gives perceptive insights into the social structure of the Navy of that now far-off day -- a society that today's Navy only superficially resembles. You even get a look at prewar Shanghai and Japanese-occupied Tsingtao through the eyes of the S-39 wives as they, in the words of the old song, "--all go up to China in the springtime."

The war was expected and becoming rapidly more imminent when you are introduced in 1940 to the S-39, Manila and Cavite, and the nearly non-existent Asiatic Fleet. The most effective part of that fleet, the Asiatic submarines, included a few of the pre-war fleet boats, plus the S-boats.

There is no one on active duty today who ever served in an S-boat. There have been two massive and several minor changes in submarine technology since they were designed in the years following World War I. They were riveted rather than welded, had quite different pressure hull and ballast tank systems than were later used, a test depth of about 200 feet, a relatively inflexible propulsion system, no radar, no fathometer, primitive sonar, and incredible from today's perspective, given the tropical nature of Asiatic operations, no air conditioning. By 1940 they were (including the S-39), pretty much worn out and rapidly becoming beyond effective repair.

The life at sea and ashore of the S-39 officers and men, their wives and girl friends, for this period and thruout the book, is given in living color. Mrs. Gugliotta already knew some of the people involved, then located and interviewed many more, not only from the S-39, but also from other submarines plus many others that witnessed those times. She has a good eye for the fine details of everyday life and this makes her characters three dimensional and lets the reader see them in full color. There are occasional illuminating off-track insights, such as the glimpse of the U.S. Army on Corregidor, fully prepared with their coast defense guns for a shore bombardment, a la the Spanish-American war, but totally unready for the air bombardment that really came.

When the war starts for them on December 8, 1941, the S-39 and her officers and men move into the main stream of those terrible events of the early months of 1942, first in the Philippines and then in the Dutch East Indies. We see the officers and crew fighting equally the Japanese and the limitations of the aged submarine. Their life is more like that of the Germans in "Das Boot" than like life in the new American fleet boats that were beginning to come out. There is a

glimpse of Java and the Colonial Dutch just before the Japanese sweep through; and that rich and fascinating culture disappears forever.

Mrs. Gugliotta's description of the war patrols of the S-39, with their triumphs, frustrations and discomforts are as good as anything of this kind that I have read. The bibliography shows that she has read extensively on the subject, but of course the real wellsprings of information were the many, obviously skillful interviews of people who were there, Not the least of these was probably a non-stop interview of her husband.

The most absorbing part of the book begins with the departure of the S-39 from Australia on the cruise that leads to her grounding and final destruction on a reef near Rossell Island, off the eastern tip of New Guinea. At this point, many of the officers and crew that we met earlier have been transferred, and the boat has a new skipper.

On August 14, 1942, they are enroute to their new patrol area when at a little after two in the morning they run solidly aground. In the preface of the book Mrs. Gugliotta notes that there are either no heroes on the S-39 or that they all are. By any reasonable definition of the word, they were all heroes during the terrible hours that followed the grounding. Certainly, in their selflessness and bravery, they could well serve as role models for young officers and men in the Navy today or any other day.

During the late 1940's I served with Monk Hendrix, who was a young Lieutenant(jg) on the S-39 at that time, and heard from him the story of his swim through the seas that were combing past the grounded boat, to carry a line to the reef ahead of them. The establishment of a line from the boat to the reef was the event that probably enabled the survival of the S-39 crew, who were

picked up from the other side of the atoll two days later. Monk died several years ago, before Mrs. Gugliotta had an opportunity to interview him in detail. Had he lived, he might well have been able to add some key details to this and several other parts of the book.

Mrs. Gugliotta has performed a real service, not only to the reader of this richly detailed book, but also to the community of historians who are beginning to try to assess the events of World War II at the micro-level. A tremendous opportunity still exists to capture the detail of events of that period from the living memories of those who were there. But these men and women are now old and are fast disappearing. I hope that Mrs. Gugliotta will take her tape recorder and notebook to future meetings of the Submarine Veterans of World War II, and that others will follow her lead.

I would recommend PIGBOAT 39 to anyone interested in submarines, but it should be of particular interest to officers and men in today's submarine Navy who would like to know more of their antecedents and who might be willing to find in the challenges met in those earlier turbulent days, some guidance for themselves.

Ira Dye

NAVAL SUBMARINE LEAGUE
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