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REPORT

ON

UNITED STATES NUCLEAR-POWERED
ATTACK SUBMARINE PROGRAM

BY THE

SEAPOWER AND STRATEGIC AND CRITICAL
MATERIALS SUBCOMMITTEE

OF THE

COMMITTEE ON ARMED SERVICES

HOUSE OF REPRESENTATIVES

NINETY-SIXTH CONGRESS

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DECEMBER 12, 1979



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LETTER OF TRANSMITTAL

U.S. HOUSE OF REPRESENTATIVES,
SEAPOWER AND STRATEGIC AND
CRITICAL MATERIALS SUBCOMMITTEE;
COMMITTEE ON ARMED SERVICES;
December 12, 1979.

HON. MELVIN PRICE,
*Chairman, Committee on Armed Services,
U.S. House of Representatives,
Washington, D.C.*

MY DEAR MR. CHAIRMAN: There is transmitted herewith a report by the Seapower and Strategic and Critical Materials Subcommittee on the U.S. Nuclear-Powered Attack Submarine Program.

The attached report, which was unanimously approved by the subcommittee members, attempts to portray, to the degree that security considerations will permit, the basis for the subcommittee's concern that the nuclear-powered attack submarine program proposed by the Department of Defense is woefully inadequate.

On the basis of the evidence developed in extensive hearings held in open and executive sessions, the subcommittee recommends that:

1. The rate of authorization of nuclear-powered attack submarines be increased to at least three, and preferably four, per year.
2. The Navy proceed with design of an improved SSN-688 *Los Angeles* class submarine on an urgent basis.
3. SSN 688 class attack submarines continue to be authorized until the design of an improved version of this class ship has been developed sufficiently to start construction.
4. A vigorous research and development program be pursued to ensure that the United States provides improved capabilities in our future nuclear-powered attack submarines, and that emphasis not be placed on securing less capable submarines until the recommended minimum of 90 of the most capable nuclear attack submarines is reached and maintained.

Respectfully,

CHARLES E. BENNETT,
*Chairman, Seapower and Strategic and
Critical Materials Subcommittee.*

LETTER OF TRANSMITTAL

U.S. House of Representatives
Armed Services Committee
Subcommittee on Military Operations and
Readiness
Washington, D.C.
December 12, 1952

Hon. Martin Price
Chairman, Committee on Military Operations,
U.S. House of Representatives
Washington, D.C.

My Dear Mr. Chairman: There is transmitted herewith a report
by the Research and Statistics and Critical Materials Subcommittees
on the U.S. Nuclear-Powered Attack Submarine Program.
The attached report, which was unanimously approved by the sub-
committee members, attempts to bring to the attention of the
committee members all items of the submarine's program
that the nuclear-powered attack submarine program proposed by the
Department of Defense is worthy of consideration.

On the basis of the evidence developed in extensive hearings held
in open and executive sessions, the subcommittee recommends that
1. The rate of authorization of nuclear-powered attack submarines
be increased to at least three, and preferably four, per year.

2. The Navy proceed with design of an improved SSN-588 Los
Angeles class submarine on an urgent basis.

3. SSN-588 class attack submarines continue to be authorized
and the design of an improved version of this class ship has been
developed sufficiently to start construction.

4. A vigorous research and development program be pursued to
ensure that the United States provides improved capabilities in our
nuclear-powered attack submarines, and that emphasis not be
placed on securing less capable submarines until the recommended
number of SSN-588 class attack submarines is achieved.

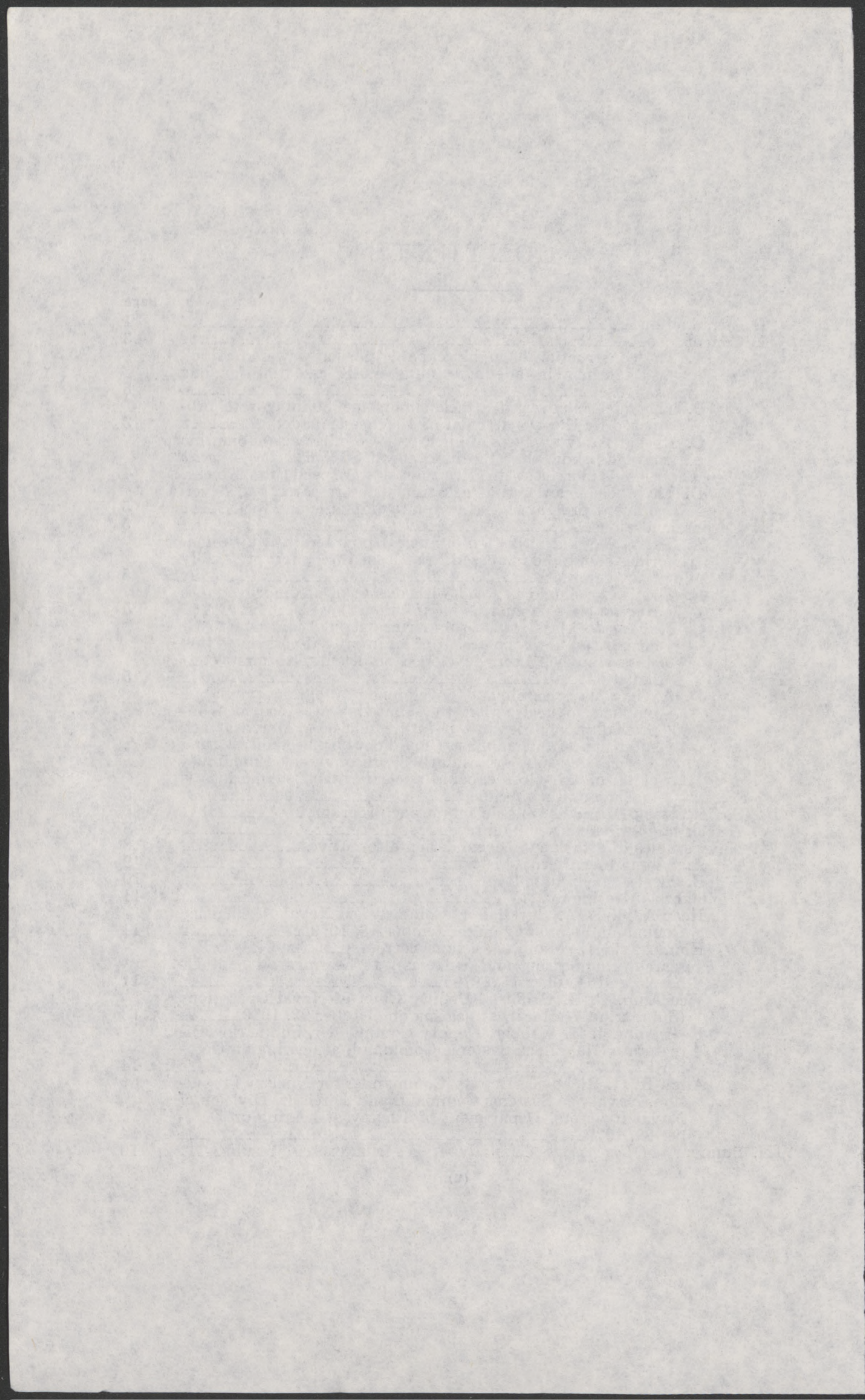
Respectfully,

Charles E. Brunner
Chairman, Research and Statistics and
Critical Materials Subcommittees

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UNITED STATES NUCLEAR-POWERED ATTACK SUBMARINE PROGRAM

I. INTRODUCTION

One of the most essential elements of the defense of the United States is our fleet of nuclear powered strategic and attack submarines. It is generally recognized that the Polaris/Poseidon/Trident nuclear-powered ballistic-missile submarines provide an exceptionally effective means for deterrence of *nuclear war*. However, it does not appear to be as widely recognized that in conventional war, a more likely type of warfare, our nuclear-powered *attack* submarines provide one of the most potent and versatile means we have to keep open the sea lanes essential to our nation and our allies; to defend our most valuable surface ship task groups from enemy submarines; and to carry a war to the shores of any potential adversary.

Nuclear-powered attack submarines have historically not received consistent support within the Defense Department commensurate with their importance. From the inception of the nuclear-powered submarine program three decades ago, the Congress has repeatedly had to take the initiative to spur the Defense Department into taking action. In fact, Congress appropriated the funds for the power plants for the first two nuclear submarines, the *Nautilus* and the *Seawolf*, in the Atomic Energy Commission budget because the Department of Defense did not recognize the importance of developing nuclear submarines. A decade ago, the Defense Department planned to stop building any more nuclear submarines, at the very time the Soviets were about to pass us in numbers of nuclear submarines, which they did in 1970. Congress rejected that plan and insisted on getting started on a higher speed nuclear-powered attack submarine, the SSN 688 *Los Angeles* class. Almost every year since, including this year, Congress has added funds for SSN 688 class submarines to the budgets requested by the Department of Defense. Thirty-five of these ships have now been authorized for construction, of which 10 are now operational. Many of the other 64 nuclear-powered attack submarines currently in operation will become obsolete by the time the presently authorized *Los Angeles* class submarines are completed over the next 6 years. The obsolescence problem will become even greater in later years.

Since 1973, the Navy has stated it has a *minimum* requirement of 90 nuclear-powered attack submarines if it is to carry out its mission in wartime. However, more recent testimony indicates the number which would really be required to fulfill all the wartime missions is about 50 percent higher. With the impending retirement of submarines too old for service, the Navy will fall below even the minimum required force level of 90 if the procurement rate of only one nuclear attack submarine per year is continued. The subcommittee is also concerned that such a low building rate will inevitably lead to erosion of the

Nation's nuclear submarine industrial base. As a first step to redress this problem, the subcommittee early this year initiated action to add a second *Los Angeles* class nuclear attack submarine to the fiscal year 1980 Department of Defense Appropriations Authorization Act.

From fiscal year 1970 through 1977 there was an average of about four, and a peak of six, SSN 688 class submarines authorized per year. But for fiscal years 1978 and 1979 the program was cut back to one per year, and the Department of Defense has proposed continuing that low rate at least through fiscal year 1984. Meanwhile the Soviets, who already have 16 more nuclear-powered attack and cruise missile submarines in operation than we do, have been building these types of submarines at the rate of four per year in the past several years and are expanding their submarine facilities. Only recently have a few U.S. nuclear attack submarines begun to carry Harpoon cruise missiles fired from torpedo tubes. Development of improved, more capable cruise missiles for submarine application is underway. There is fiscal year 1980 R. & D. money for this. This is an urgent need.

It was recently reported in the press that the Soviets have put into operation a very fast nuclear-powered attack submarine with a top speed of over 40 knots and with a titanium hull which allows it to dive very deep. At about the same time that the existence of this very fast, deep diving Soviet submarine was announced, press reports emanated from the Pentagon that the Navy intended to save money on our submarines by going back to building slower attack submarines.

Alarmed by the very small number of attack submarines planned by the Department of Defense and by indications that the Navy plans to respond to major advances in Soviet submarine capabilities by reducing the capability of our future attack submarines, the subcommittee held a series of hearings on the nuclear-powered attack submarine program. Some of the hearings were held in executive session so that the subcommittee could be apprised of all available information. However, to the maximum extent practicable the hearings were held in open session so that the information could be immediately made available to the public. A list of witnesses and a summary of their testimony is included in a later section of this report. This report is based on the information provided in these hearings as well as the knowledge and experience gained by the subcommittee over many years of study of our Navy's requirements.

Based on testimony received, it is apparent the Soviets are continuing rapid expansion of their Navy. It is also evident that they have placed the highest national priority upon their nuclear-powered attack and cruise missile submarine force. It continues to grow in both quantity and capability at a far greater rate than our own. A later section of this report summarizes the status of the Soviet attack and cruise missile submarine program.

The growing Soviet naval threat makes the decisions as to quantity and capability of future U.S. nuclear-powered attack submarines of crucial importance to the future well-being of the United States. The subcommittee, therefore, reviewed carefully the results of two studies which have been underway in the Navy to consider the future course of attack submarine development. The Submarine Alternatives Study, initiated by the Secretary of the Navy as a result of a request by the Senate Armed Services Committee, evaluated the design, cost, and

effectiveness of several nuclear attack submarine candidates. Subsequently, the Chief of Naval Operations initiated a Fleet Attack Submarine Study which is investigating some of these attack submarine candidates in greater depth.

This report summarizes the basis for the subcommittee's concern that the future nuclear-powered attack submarine program proposed by the Department of Defense is woefully inadequate, and presents the subcommittee's conclusions and recommendations.

II. CONCLUSIONS

As a result of its investigation, the subcommittee concludes that:

A. THE CONSTRUCTION OF HIGHLY CAPABLE NUCLEAR-POWERED ATTACK SUBMARINES IN ADEQUATE NUMBERS IS ESSENTIAL FOR OUR DEFENSE

1. The United States is an island nation dependent upon free use of the seas to ensure the delivery of critical raw materials and to provide support to our allies. Soviet nuclear attack submarines represent the greatest threat to our ocean lifelines. Our nuclear-powered attack submarines are the most effective weapon system we have to locate and sink enemy submarines. The Soviet attack submarine threat can successfully be countered only if our Navy builds highly capable nuclear-powered attack submarines in adequate numbers.

2. The Soviets already have greater than 20 percent more nuclear-powered attack and cruise missile submarines than the United States and have been continuing to build more per year than has the United States. The United States has, therefore, conceded to the Soviet Union a substantial numerical superiority in attack and cruise missile submarines. The United States must make up for what it lacks in quantity by ensuring adequate capability of its submarines.

3. The Soviet Union is making significant advances in the capabilities of its nuclear-powered attack submarines with a clear intent to achieve qualitative superiority in speed and depth capability.

4. Future capabilities of Soviet submarines cannot be predicted with precise accuracy. Thus, future U.S. submarine designs should not unduly be based on current Soviet capabilities or estimates of Soviet intentions, which are not encouraging in any event.

5. It takes 5 to 10 years to design, develop and build a new submarine, which then must operate for 20 to 30 years. If the most advanced capability is not incorporated into a submarine at its inception, it is extremely difficult if not impossible to retrofit improved capabilities to meet a future threat.

B. THE NUCLEAR-POWERED ATTACK SUBMARINE BUILDING RATE PROPOSED BY THE DEPARTMENT OF DEFENSE IS INADEQUATE

1. The Defense Department's most recent 5-year defense plan calls for authorizing only one nuclear attack submarine a year. Considering the need to retire older units, this rate of construction is inadequate to maintain beyond the 1980's the very minimum force level of 90 attack submarines required by the Navy.

2. A U.S. nuclear-powered attack submarine construction program of only one per year will not permit keeping the two private shipyards currently building such ships engaged in this work. On the basis of economy and national defense, the United States cannot afford for all nuclear-powered attack submarine construction to be concentrated in only one shipyard.

C. RECENT NAVY ANALYSES OF NUCLEAR-POWERED ATTACK SUBMARINE DESIGNS SHOW THAT THE HIGH SPEED SSN 688 "LOS ANGELES" CLASS IS MORE COST-EFFECTIVE THAN SLOWER SPEED SUBMARINES

1. Based on the results of the Navy's Submarine Alternatives Study and testimony from witnesses, the *Los Angeles* class submarine is the most cost-effective nuclear-powered attack submarine design which can carry out the missions U.S. attack submarines need to be able to perform in wartime.

2. Results of fleet exercises by *Los Angeles* class submarines confirm the importance of the higher speed capability of this class.

3. A nuclear-powered attack submarine speed reduction of 5 knots, for example, represents a critical tactical disadvantage that could result in loss of target opportunity or loss of one's own submarine in combat.

4. There is indication that some Defense Department officials are leaning in the direction of building submarines based on the SSN 637 *Sturgeon* class design that would be significantly slower than submarines based on the *Los Angeles* class design. The sole reason stated for building the less capable ships is to reduce costs.

5. The maximum savings cited for the slower nuclear attack submarine design being considered would appear to allow buying four of these submarines instead of three of the *Los Angeles* class for the same total procurement cost. However, even though the cost per submarine would be less, the number of submarines required to achieve equal force effectiveness would be greater. The Navy studies indicate the total cost of the slower submarines would be greater because of the larger number required. Further, there is no plan or guarantee that the Defense Department attack submarine building program would be increased if the United States began building an inferior, cheaper design.

6. The Navy is evaluating the development of a fleet attack submarine based on a *Sturgeon* class design, but with improved performance over the original design. The Navy is also considering application of the same technology to improving the *Los Angeles* class design submarines; this would retain for the improved *Los Angeles* class a significant speed advantage compared to the improved *Sturgeon* class. An improved *Los Angeles* type submarine would have the greatest potential of any design we could authorize in the next several years to counter future Soviet submarine advances. An improved *Los Angeles* type submarine is expected to have construction costs comparable to present *Los Angeles* class submarines.

D. THE NUCLEAR-POWERED ATTACK SUBMARINE RESEARCH AND DEVELOPMENT PROGRAM LACKS ADEQUATE EMPHASIS AND FOCUS

The dependence of the United States on superior capabilities of its nuclear-powered attack submarines requires that the United States have a strong submarine research and development program, adequately funded and directed, and clearly focused on improvements in performance capability which the submarine operators consider important.

III. RECOMMENDATIONS

The Seapower and Strategic and Critical Materials Subcommittee recommends that:

A. The rate of authorization of nuclear-powered attack submarines be increased to at least three, and preferably four, per year. The building rate should be at a level sufficient to attain and maintain a force level of no fewer than 90 of the most capable nuclear-powered attack submarines, taking into consideration the planned retirement of submarines of older classes. The submarine building program should be managed so as to retain two viable attack submarine construction shipyards in order to retain competition in contracting and an adequate production base for expansion.

B. The Navy proceed with design of an improved *Los Angeles* class submarine on an urgent basis. This ship should incorporate advancements in design and technology that would most enhance the capability of our future attack submarines to counter future Soviet submarine advances. Of particular importance is that the maximum speed be achieved with the existing reactor design. This will provide our Navy with the most cost-effective nuclear-powered attack submarine we can build to meet the threat in the 1980's and beyond.

C. SSN 688 *Los Angeles* class attack submarines continue to be authorized until the design of an improved version of this class ship has been developed sufficiently to start construction.

D. A vigorous research and development program be pursued to ensure that the United States provides improved capabilities in our future nuclear-powered attack submarines. Emphasis should not be placed on securing less capable submarines until the recommended minimum of 90 of the most capable nuclear attack submarines is reached and maintained.

IV. SOVIET ATTACK AND CRUISE MISSILE SUBMARINE PROGRAM

Soviet attack and cruise missile submarines are designed to attack allied merchant marine and naval ships. A primary mission of United States nuclear-powered attack submarines is to counter the Soviet attack and cruise missile submarine threat.

A highly classified briefing on the Soviet submarine program was presented to the subcommittee by representatives of the Naval Intelligence Command. This in-depth presentation provided the current status of all we know regarding Soviet submarine development and operation. Additional testimony on the significance of the Soviet

submarine threat was provided by other witnesses during the course of the hearings. Although much of the information is classified, this report presents a summary of unclassified information that can be released.

The subcommittee is deeply concerned with the magnitude and quality of the Soviet submarine program. Their program clearly indicates that the Soviets, as a matter of highest national priority, are striving for a submarine force capable of disrupting the sea lines of communication to the United States and its allies and capable of neutralizing or sinking our aircraft carrier battle groups. The United States must provide an attack submarine force which, in conjunction with other anti-submarine warfare forces, is capable of countering this threat. Otherwise, if challenged by the Soviets, the United States will not be able to conduct overseas military operations anywhere in the world, or be able to ensure the delivery to the United States of critical supplies including oil.

The Soviet understanding of the importance of submarines in naval warfare is characterized by a statement by the Commander in Chief of the Soviet Navy, Admiral of the Fleet of the Soviet Union, Sergei Gorshkov. He has stated:

Atomic powered submarines, armed with various missiles and homing torpedoes and equipped with improved means of navigation, control, and communications, presently represent the chief means of accomplishing the main mission of the (Soviet) Navy.

The implementation of this statement is demonstrated by the Soviet construction program for nuclear-powered submarines. The Soviet submarine fleet is substantially larger than that of the United States and the gap between the two fleets is growing. Nuclear-powered submarines in the Soviet fleet have increased from 69 in 1969 to about 155 today, surpassing the United States in 1970. In addition to the increase in number of ships, the Soviets have made significant strides, both tactically and technically, in the capability of their submarine force. Today the Soviet submarine fleet is not only the world's largest—with 357 compared to our 122—but it is also a potent and modern force which includes a wide variety of submarine types.

In the specific area of attack and cruise missile submarines, the present situation in trends as well as in numbers is of particular concern. The Soviets have a total of 265 attack and cruise missile submarines compared to our 81. Of their total, about 90 are nuclear powered, 40 of which carry cruise missiles in separate launchers in addition to torpedoes. By comparison, the United States has 74 nuclear-powered attack submarines, and the United States is just now introducing into the submarine fleet the Harpoon cruise missile which can be fired from torpedo tubes.

The Soviet lead in number of submarines will continue in the future, as demonstrated by both the Soviet's past building rate and their increase in submarine construction capability. As late as 1966, the Russians had only two new construction yards for building nuclear submarines; today they have four. All U.S. nuclear submarine construction facilities could be placed into just one Soviet submarine

facility. Yet they are continuing to expand their submarine construction facilities. The Soviets are building nuclear-powered attack and cruise missile submarines at a rate of about four per year while our Department of Defense building program includes only one attack submarine per year through fiscal year 1984.

In order to counter this disadvantage in numbers, the United States has depended upon maintaining a qualitative advantage over Soviet submarines. However, from testimony to the subcommittee, it is clear the Soviets have been and are continuing to apply much greater effort to the development of improvements in submarine design than is the United States.

In the past 10 years the Soviets have introduced more new submarine designs than have ever been put to sea during a comparable period in all of naval history. Since 1968, the Soviets have introduced at least nine new submarine designs, or major modifications in design, besides converting older submarines to improve their capability. They have introduced significantly improved versions of their attack, cruise missile, and ballistic missile nuclear submarines. In doing this they have developed a large cadre of submarine designers. These experienced designers can be expected to produce significant innovations and improvements, as yet unidentified by our intelligence sources, for application to Soviet submarines of the future.

A further example of the tremendous effort the Soviets have dedicated to the submarine program is the new very high speed, deep-diving *Alfa* class nuclear-powered attack submarine recently publicized in the Western press. In 1971, the first of the *Alfa* class submarines went to sea. Upon initial introduction the *Alfa* was generally considered by Western sources to be a failure. Yet further construction continued and additional units have been launched. (This class of submarine has recently been reported in the press to have a speed of over 40 knots and to have a titanium hull capable of diving very deep.) Although it is not yet clear how many of these ships will be built, it is clear that the Soviets could not have developed this class of attack submarine without applying tremendous resources—far greater than is being done by the United States—to the task. The effort spent on this submarine class alone is a clear indication that the Soviets are intent on developing an attack submarine force that has a combat capability far superior to ours.

During the period in which the Soviets have been working on the *Alfa* class, they have produced more than 35 ships of other submarine classes. In addition, during this period, they developed at least four new classes of nuclear submarines, at least one class of diesel submarine, and initiated at least two nuclear submarine conversion programs.

It is evident that the Soviet submarine program has strong top level Government support and virtually unlimited funding. They have a centrally controlled program that has had continuity and direction for many years. They have built up a huge array of facilities, tried out many designs, and learned from their mistakes. They continue new developments in parallel with producing their best available current models in a highly organized, effective way. The size and capability of the Soviet attack and cruise missile nuclear-powered submarine force can be expected to increase rapidly in the years ahead.

V. ATTACK SUBMARINE CONSTRUCTION RATE

The current 5-year defense plan, submitted to the Congress by the Defense Department, plans authorization of only one nuclear-powered attack submarine per year through 1984. If accepted, this low construction rate will eliminate the ability to maintain the minimum required attack submarine force level, and eliminate the ability to retain nuclear-powered attack submarine construction capability in two shipyards, important for reasons of competition and providing an adequate expansion base.

As the 35 SSN 688 *Los Angeles* class submarines authorized to date continue to be delivered over the next 6 years, the attack submarine force level will, by about 1984, reach the minimum required level of 90 set by the Chief of Naval Operations. However, soon thereafter the force level will begin a steady decline as the retirement rate of older, obsolete submarines exceeds the one per year delivery rate for the attack submarines now planned by the Department of Defense for authorization through 1984. To offset this decline and maintain the minimum required force level of 90, the authorization rate must be increased to at least three or four ships per year.

Further, at the current construction rate of only one attack submarine per year, there is substantial risk that the United States will lose one of its two remaining nuclear-powered attack submarine shipbuilders. These two shipyards currently have sufficient capacity to build five nuclear-powered attack submarines per year in addition to Trident submarines and nuclear-powered surface ships. With only one Trident and one attack submarine authorized per year, competitive bidding will suffer and both shipyards will not stay in the attack submarine construction business.

An increased construction rate will help the Navy maintain attack submarine construction capability in these two building yards. This is important for the following reasons:

- (1) to retain a mobilization base; to provide the industrial base to support the increased building rates that must eventually be achieved to maintain force level without prolonged startup time, and

- (2) to avoid reliance on a single supplier; to maintain a competitive situation in submarines, both business and technical.

The currently planned reduced submarine construction rate not only affects the shipyards but also the many suppliers of materials and machinery for these submarines. The Navy has reported that it is becoming increasingly difficult to persuade these suppliers to commit their resources to Navy work. As these resources are diverted to other business, the submarine and nuclear industrial base will eventually lose its ability to respond to demands for high production rates, without excessive startup time and costs.

VI. NAVY STUDIES OF ATTACK SUBMARINE DESIGN ALTERNATIVES

Current Navy studies of alternative attack submarine designs assume that the latest design weapons and sensors will be installed in any new design U.S. attack submarine. They also assume for all alternatives the same depth capability and the same radiated noise at a given speed.

The principal variable assumed for the alternative attack submarine designs being considered by the Navy is speed, since the maximum speed has a major impact on the size of the power plant and cost of the submarine.

Just as in other aspects of warfare, speed is a vital element in submarine warfare. It was brought out in testimony that speed can spell the difference between victory and defeat. Superior speed capability allows the submarine commander to take the initiative in obtaining the most advantageous tactical position from which to prosecute attack. It allows him to catch targets detected at long ranges or to escape from a bad tactical situation. High speed gives the ability to recover from mistakes or errors in judgment which inevitably occur in the uncertain submarine warfare environment.

Some missions, such as direct escort support of high speed surface task groups, can only be performed by submarines with a high speed capability at least equal to the *Los Angeles* class. All missions are performed better by higher speed submarines.

The Soviet Navy emphasizes speed in its attack submarines. Admiral Gorshkov has stated, that, ". . . the ability to conduct swift actions will become the most important indication of a mastery of the art of naval warfare." As previously noted, the Soviets' new *Alfa* class attack submarine has been reported in the press to have a speed greater than 40 knots. It does not make sense to the subcommittee for the United States to respond to this development by reducing the top speed of our future attack submarines.

For example, if the United States were to build submarines five knots slower than the *Los Angeles* class, this would mean:

- a. The slower U.S. submarines would be unable to keep up with and attack most Soviet nuclear-powered attack submarines.
- b. The slower U.S. submarines would be unable to stay with and attack high speed surface ships.
- c. The slower U.S. submarines would be unable to escort U.S. surface ships in high speed operations.
- d. The slower U.S. submarines would require an extra day and a half to transit the Atlantic. In a day and a half, one nuclear attack submarine could search an area roughly the size of New England.

A. Submarine Alternatives Study

In May 1978, the Secretary of the Navy, as a result of a request by the Senate Armed Services Committee, requested that the Assistant Secretary of the Navy for Research, Engineering and Systems, Dr. David E. Mann, conduct a Submarine Alternatives Study to "define and analyze alternative nuclear submarine forces to satisfy the Navy's near-term objectives." The Secretary stated that "attention should be directed to options which offer the prospect of significantly reducing costs while retaining operational adequacy."

In the testimony before this subcommittee, the results of this study were discussed and the following key points were made:

1. Smaller submarines, though cheaper, are also slower and less effective.
2. The highest speed submarine designs studied, that is, those based on the *Los Angeles* class, are the most cost-effective, even though some attack submarine missions requiring high speed were

not considered in the analysis. The comparative effectiveness of the *Los Angeles* class would be even greater than shown in the analysis, if these high speed missions were included in the calculations.

3. The speed differential between the *Los Angeles* class and the *Sturgeon* class is worth the extra cost of the faster submarine.

4. A slower, less effective attack submarine is estimated to have a procurement cost 30 percent less than the higher speed submarine. However, more of the slower submarines would be required to attain the same attack submarine force effectiveness, even when some missions requiring the higher speed are not considered. For equal attack submarine force effectiveness the higher speed submarine would have a lower overall cost.

Dr. Mann in his testimony stated that building the cheaper, less effective submarines should be considered so that more attack submarines could be built to help maintain the 90 nuclear attack submarine force level required by the Navy. However, Dr. Mann could not provide any assurance of an increased attack submarine building program if the less effective submarines were built. Further, he did not explain how building inferior submarines would enable the United States to counter current and future Soviet attack submarines with high speed capability.

Vice Admiral Griffiths, the Deputy Chief of Naval Operations for Submarine Warfare, in his testimony before the subcommittee, noted that there are several tactical situations, in which speed is important, that were not evaluated in the Submarine Alternatives Study. These include the direct escort of high speed U.S. surface task forces; use of cruise missiles to attack land targets; mining; trailing enemy submarines; torpedo evasion; and tactical recovery from mistakes or errors in judgment.

B. Fleet Attack Submarine Study

In December 1978, the Chief of Naval Operations, noting that the Submarine Alternatives Study had failed to identify an attack submarine alternative which was both operationally effective and significantly cheaper, initiated the Fleet Attack Submarine Study. This study is being performed by Vice Admiral Griffiths and Rear Admiral Webber, the Deputy Commander for Submarines, Naval Sea Systems Command. Three types of nuclear-powered attack submarines—one an improved version of the *Sturgeon* class and the other two, improved versions of the *Los Angeles* class—are being considered.

While the study was not yet complete at the time of the hearings, Admirals Griffiths and Webber testified that improvements are being applied to all candidates in this study which will improve their speed capabilities. However, the speed differential between the improved designs will still be about the same as the speed differential between the present *Sturgeon* and *Los Angeles* classes. This speed differential would be even greater if the faster and larger of the two improved *Los Angeles* class designs is chosen. Therefore, the relative performance effectiveness of the improved designs would be comparable to that which currently exists between the *Sturgeon* and *Los Angeles*. Based on the type of analyses used in the Submarine Alternatives Study, the improved *Los Angeles* type ships are expected to be more cost-effective than the improved *Sturgeon* type. The fastest of these designs would be the most capable nuclear-powered attack submarine we could

design in the next several years. Several witnesses testified that an improved version of the *Los Angeles* class submarine is expected to cost about the same as the present *Los Angeles* class submarines.

VII. HIGHLIGHTS OF TESTIMONY

A highly classified briefing was given to the subcommittee on September 18, 1979 by the Commander, Naval Intelligence Command, Rear Adm. E. A. Burkhalter, and senior intelligence analysts from that command. This briefing included a detailed description of the current Soviet submarine program including their construction capacity and the operating capabilities of Soviet submarines. The analysts responded to detailed questions. This briefing was very helpful to the subcommittee in gaining a true perspective of the threat presented by the Soviet submarine program.

Subsequently, testimony was provided by the following principal witnesses:

Hon. David E. Mann, Assistant Secretary of the Navy (Research, Engineering and Systems), at September 25 and October 11, 1979 hearings.

Vice Adm. C. H. Griffiths, Deputy Chief of Naval Operations (Submarine Warfare), at October 22, 1979 hearing.

Rear Adm. J. H. Webber, Deputy Commander, Submarine Directorate, Naval Sea Systems Command, at October 22, 1979 hearing.

Adm. H. G. Rickover, Deputy Commander, Nuclear Propulsion Directorate, Naval Sea Systems Command and Director, Division of Naval Reactors, Department of Energy, at October 29, 1979 hearing.

In addition, each of the principal witnesses brought knowledgeable assistants to assist them in their testimony.

All of the witnesses who appeared in response to the committee's invitation testified to the military superiority of nuclear propulsion for submarines and to the fact that the *Los Angeles* class submarine is the best attack submarine in the U.S. Navy today. All witnesses testified that a *Los Angeles* class type ship would be the most cost-effective submarine to build in the future. The Assistant Secretary of the Navy appeared to favor building submarines slower and cheaper than the SSN 668 class ships because, with present fiscal constraints, the Navy might not be able to afford sufficient quantities of the SSN 688 type to attain the minimum required force level of attack submarines.

Honorable David E. Mann, Assistant Secretary of the Navy (Research, Engineering and Systems)

Dr. Mann presented a brief summary of why the Submarine Alternatives Study was performed and identified the major conclusions of the study. Dr. Mann stated that:

In sum, the study, by making use of all available cost data, technical analysis, and the experience of operational submariners, developed an explicit basis for relating submarine acquisition costs with performance and effectiveness and for further development of an effective but lesser cost attack submarine. Thus, the study should provide the Congress, Defense, and Navy decision authorities with greater visibility

into many of the factors that must be considered in planning future submarine building programs on the strong base provided by the 37 *Los Angeles* class ships we expect to count on in the 1990's.

In discussing the alternatives study, Dr. Mann stated:

The data show clearly that the *cost per ton* to construct a submarine is and has been fairly constant over time, moderate changes in design, and is independent of size . . . However, the key to confidence in projections based on such estimates is a smooth, well planned production schedule that allows for continuing competition and the efficient use of the available shipyard capability.

Based on this information, Dr. Mann stated:

Analysis of the factors that affect or determine the construction costs of both the 637 and 688 classes showed that while further savings could result from improvements in design and construction practice, major savings could be realized only through significant limitations on size and displacement.

After determining that cost per ton was fairly constant, Dr. Mann stated that the second part of the study was:

. . . to analyse the influence of a top speed margin on candidate submarine performance in all assigned tasks, excepting the escort of carrier task forces at high speeds. This is a task for which the 688 is especially well suited and for which the authorized fleet could suffice even in the event no more were to be built.

In further discussions Dr. Mann identified the speed difference between *Sturgeon* and *Los Angeles* as significant enough to make the *Los Angeles* worth the extra cost, but stated that in his opinion a much smaller speed difference is not important.

In discussing the number of submarines needed in the fleet, Dr. Mann stated:

. . . the force structure of 90 is adequate in the view of the CNO. We would like, and this is just a hope rather than a specific objective, but to have more than this, or as many as 120, 130 or maybe 140. The problem is cost and the problem is one of priority.

Dr. Mann stated that none of the alternatives in the Submarine Alternatives Study were preferable to the SSN 688 class candidate. He said it was:

. . . when we recognized that we could build an appreciably less effective submarine with considerable saving, or a really quite effective submarine but with only a very modest saving that I approached the then Vice Chief [of Naval Operations] Admiral Long. We discussed the need for the Navy's hull design team, headed by Admiral Jim Webber, to tackle the problem of seeing if we could reduce cost and improve effectiveness, and it is on the basis over the past 9 or 10 months that they have continued their analysis of the so-called Fleet Attack Submarine, which hasn't yet been

entirely completed but which is, I think, on the point of completion.

Dr. Mann said that he expected the cheaper alternative in the Fleet Attack Submarine Study to cost about 25 to 30 percent less than an SSN 688 class ship to procure, and that it would be more effective than a *Sturgeon* class submarine.

Dr. Mann stated that the choice of submarines was not his decision to make but rather the CNO's, and that the decision has not been made. He said that the decision would be based on the results of the CNO's Fleet Attack Submarine Study.

Vice Admiral D. H. Griffiths, Deputy Chief of Naval Operations (Submarine Warfare)

Vice Admiral Griffiths testified on his involvement with the Submarine Alternatives Study. He discussed the study in detail and his understanding of the results of the cost effectiveness analyses performed in the Study. He said:

. . . from the standpoint of the operational experience that I have, what I see, that this study has shown is that clearly it is advantageous in the type of scenarios that I envision we would fight the war, the real war, that we need the 688 speed. Admiral Griffiths also pointed out that in the study:

. . . there were several tasks that were not analyzed, the first of these being direct support, and just to set the record straight on this, experience has shown us that the 688 submarine speed is needed to escort our surface battle groups.

The other roles that were not analyzed were the power projection role, and the power projection by land attack with cruise missiles.

At the conclusion of the Submarine Alternatives Study, it was the judgment of the CNO that none of the candidates reported combined low cost with adequate performance. The Chief of Naval Material was tasked, therefore, to take a fresh look at developing an SSN conceptual design.

The resulting Fleet Attack Submarine Study being performed by the Naval Sea Systems Command in conjunction with the Office of the Chief of Naval Operations is evaluating improved *Sturgeon* and *Los Angeles* type submarines in further detail. Admiral Griffiths said that this study will show that improvements can be incorporated into later types of ships which will improve their individual speed capabilities by several knots, with the speed advantage of the *Los Angeles* type submarine over the *Sturgeon* type remaining about the same, or even greater if a faster and larger version of the *Los Angeles* is chosen.

Admiral Griffiths discussed the importance of having redundancy and therefore reliability in submarines. He said:

My opinion is we need the redundancy that we have in our submarines for safety and for reliability. One of the particular alternatives that we are looking at is a so-called base line submarine which has absolutely no redundancy built into it . . . Really we wouldn't want to go to sea in that ship because it just would be inadequate to do the job and it would not have the reliability that we need nor the sustainability that we need.

Rear Admiral J. H. Webber, Deputy Commander, Submarine Directorate, Naval Sea Systems Command.

Admiral Webber provided testimony on technical aspects of submarines. He discussed the various submarine design options, and identified the means for achieving improved performance in the submarines being considered in the Fleet Attack Submarine Study. He also provided additional testimony on the design of Soviet submarines. His testimony provided support for the conclusions presented by Admiral Griffiths.

Admiral H. G. Rickover, Deputy Commander, Nuclear Propulsion Directorate, Naval Sea Systems Command and Director, Naval Reactors Division, Department of Energy

Admiral Rickover gave his views on the status and future direction of the attack submarine program in the United States. He testified that the Navy should continue to build the SSN 688 type submarine, and further improvements should be incorporated into an improved SSN 688 class to increase its speed capability. He expressed the view that the wrong decision on procurement of submarines would mean that the Navy would eventually have an inferior submarine force at sea. He stated:

I have said many times before, in peacetime we should build the best and most capable weapons we can. In a real wartime situation we will not have time to build these complex ships at the rate we built ships in past wars. The judgment as to what type and how many we should build in peacetime is a question involving many elements not the least being how much money the Administration and Congress is willing to provide in competition with other national programs. But to reduce the capability of our future submarines while the Soviets are increasing theirs would be a grievous error.

Admiral Rickover attacked the argument that building less capable, cheaper submarines would mean the Navy will end up with a larger number of submarines. He said:

I have also heard the argument that by building cheaper nuclear-powered attack submarines the Defense Department will be able to build more of the cheaper units and thus help the numbers problem. In other words we should trade ships capability for some future unknown construction program. As this Committee is well aware, the shipbuilding program changes all the time and is as unpredictable a thing as anything in government. The absence of a firm shipbuilding program is a major problem for this country, and I have no faith in any pledge by anyone that by building a cheaper nuclear-powered attack submarine, more will be built. There is no past experience to suggest this will ever happen because no one can make such a commitment the way our government deals with ship construction.

Admiral Rickover provided his comments on the importance of speed in a submarine and the need for the high speed capability of

the SSN 688 class. In particular he provided an assessment of a reduction in speed. He stated:

It has been suggested that a relatively small reduction in the speed of a new attack submarine as compared to what we have with the *Los Angeles* class would not be important. Yet, in submarine warfare speed is vitally important. As time doubles, the area in which a target can hide increases by a factor of four. Thus in 10 minutes a 25-knot target could be anywhere within 54 square miles; in 20 minutes he could be anywhere within 218 square miles; and so on. If the same target were traveling 5 knots faster, in 20 minutes the area in which he could hide would be 314 square miles—roughly a 50 percent increase. Thus, whether one is the target or the attacker, every minute counts and every knot less speed means more time for the opponent to gain better position.

The impact of a low procurement rate for submarines was discussed. He said:

At the current building rate of only one attack submarine per year, there is a substantial risk that the United States will lose one of its two remaining submarine shipbuilders. Although the present projected submarine workload could be handled by one shipbuilder, it would be a great mistake to allow one yard to corner the market on submarine construction. With only one *Trident* and one *Los Angeles* class submarine per year, competitive bidding may not guarantee that two shipyards will stay in the submarine construction business.

Admiral Rickover also addressed the question of building less capable submarines to carry out those missions which do not require a higher capability. He said:

An argument that has been made is that we should stop building the *Los Angeles* class of nuclear attack submarines and build some less capable submarines to perform less demanding missions. Of course there are missions you can think of which do not require advanced capabilities. But with the large Soviet submarine force that is rapidly increasing its capabilities, and the long sea lines of communication we have to defend around the world, we need submarines that can perform multiple missions, including the most difficult. In a war, how can we possibly know in advance which missions a given submarine will be called upon to perform? If we were to have a submarine program of the scope of the Soviets, we might be able to build some limited mission submarines since we would have more than enough to take care of the primary objectives. But we do not have enough. Since we do not try to match the Soviets in numbers, we must build the most capable ships we can.

It is also important to realize that we already have, to some extent, a mix of less capable attack submarines now and this will continue into the future. These are the older submarines

such as the 7 diesel units and the early nuclear-powered attack submarines. They were not built to be less capable. Each ship in its day was built as a fully capable unit based on the technology then available. When you have a continuous construction program time itself provides less capable submarines. To build new submarines purposely with reduced capabilities would result ultimately in a force consisting preponderantly of limited mission ships—some new, some old. Adoption of such a strategy would make the Soviet problem much easier.

Admiral Rickover discussed the need for improvements in research and development work. He said:

The situation with regard to attack submarine related research and development is just one more outgrowth of the Defense Department's continued refusal to recognize the importance of the attack submarine in our national defense. The funding devoted to attack submarine research and development, like that devoted to submarine construction, is woefully inadequate. As a result, much needed and useful work is not being done or is being funded at such a low level as to be practically useless. Rather than a well rounded, well planned program in all submarine related areas, we have one in which priorities and emphasis constantly shift in response to new problems or new people in management positions.

VIII. SUMMARY OF "LOS ANGELES" CLASS ADVANTAGES FROM EXERCISE RESULTS

In evaluating the importance of speed for future nuclear-powered attack submarine designs, an obvious question is how well the high speed *Los Angeles* class has performed to date. In probing this area the subcommittee learned that actual at-sea exercises have been performed which confirm the value of the *Los Angeles* class compared to the slower *Sturgeon* class it was designed to replace. These exercises have provided the following demonstrations of the advantages of the *Los Angeles* class:

Only the high speed *Los Angeles* class submarines have been able to escort high speed surface task forces effectively.

Los Angeles class submarines have proven their ability to search a given area faster and more effectively than slower submarines.

Los Angeles class submarines have proven their ability to maintain contact on high speed targets which would have escaped from slower submarines.

When counter-detected by opposing submarines, *Los Angeles* class submarines have used their speed to clear the area before an effective counter-attack can be launched.

Los Angeles class submarines can repeatedly attack high speed enemy task forces, evade counter-attacks, and reattack the task forces even when they attempt to escape at speeds which have

caused older, slower nuclear-powered submarines to fall behind and lose contact.

The SSN 688, *Los Angeles* class nuclear attack submarines are clearly superior to any attack submarine in the U.S. Navy inventory. It does not make sense to invest in a less capable submarine unless we can afford the luxury of added numbers of submarines beyond our minimum critical peacetime requirements of 90 of the most capable nuclear attack submarines.



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