

# U.S. NAVAL FORCE ALTERNATIVES

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## PREFACE

As the Budget Committees consider the first concurrent resolution targets for national defense, one major issue with important long-term consequences is the future size and character of Navy general purpose forces. Decisions about whether to expand or reduce the fleet and whether new major surface escorts should be all nuclear-powered or not will have a significant impact on budgets for fiscal year 1977 and beyond.

These major budget issues are addressed in the national defense section of the CBO report, Budget Options for Fiscal Year 1977. This document explains in greater detail the naval forces and programs discussed in that report and examines some additional considerations.

This paper was prepared by Dr. Dov S. Zakheim of the National Security and International Affairs Division of the Congressional Budget Office. The author wishes to acknowledge the substantial contribution of Dr. James Capra, also of CBO.



## ABBREVIATIONS

### Ship Symbols

AD	Destroyer Tender
AE	Ammunition Ship
AF	Store Ship
AFS	Combat Store Ship
AGOS	Sonar/Surveillance Boat (SURTASS)
AO	Fleet Oiler
AOE	Fast Combat Support Ship
AOR	Fleet Replenishment Oiler
AR	Repair Ship
ARS	Salvage Ship
AS	Submarine Tender
ASR	Submarine Rescue Ship
ATF	Fleet Ocean Tug
ATS	Salvage Tug
CGN	Guided Missile Cruiser (nuclear powered) (formerly
DLGN	Guided Missile Frigate-nuclear powered)
CSGN	Guided Missile Strike Cruiser (nuclear powered)
CVA	Attack Aircraft Carrier
CVN	All-purpose Aircraft Carrier (nuclear powered)
DD	Destroyer
DDG	Guided Missile Destroyer
DE	Destroyer Escort
FFG	Guided Missile Frigate (formerly
PF	Patrol Frigate)
LCC	Amphibious Force Command Ship
LHA	General Purpose Amphibious Assault Ship
LKA	Attack Cargo Ship
LPD	Amphibious Transport Dock
LPH	Amphibious Assault Ship
LSD	Dock Landing Ship
LST	Tank Landing Ship
MCM	Mine Countermeasures Ship
SSBN	Fleet Ballistic Missile Submarine (nuclear powered)
SSN	Attack Submarine (nuclear powered)

### Other Abbreviations

Amp.As.	Amphibious Assault
ASW	Antisubmarine Warfare
CDS	Construction Differential Subsidy
MarAd	Maritime Administration

Other Abbreviations (continued)

MINE CM	Mine Countermeasures Ship
MEF	Marine Expeditionary Force
SCN	Shipbuilding and Conversion
UnRep	Underway Replenishment Ships
URG	Underway Replenishment Group

(VI)

# CONTENTS

	Page
Preface .....	iii
Abbreviations .....	v
Summary .....	1
Chapter I—Introduction .....	5
Chapter II—Background: Reduction of U.S. Navy despite unchanged mission and increasing capability of Soviet Navy .....	11
Major Navy missions unchanged .....	11
Development of Soviet offensive naval capability .....	12
Allied naval contribution difficult to ascertain .....	13
Chapter III—Alternative force levels: Introduction .....	15
Choosing an alternative size .....	15
Possible directions for further analysis .....	18
Chapter IV—Alternative force levels: a 600-ship fleet .....	21
Toward a 600-ship force level .....	21
Growth in number of carrier task forces .....	21
Proposed annual building rate twice that of previous decade .....	22
Chapter V—Alternative force levels: A 500-ship fleet .....	25
A 500-ship current baseline alternative .....	25
Higher procurement costs if title VIII is fully implemented .....	25
Chapter VI—Alternative force levels: A 400-ship fleet .....	29
Toward a 400-ship alternative .....	29
Effects on shipbuilding industry .....	29
Chapter VII—Nuclear powered escorts: Costs and capabilities .....	33
Introduction .....	33
Cost comparison of nuclear (CSGN) and conventional (DDG-47) escorts .....	34
Assessing the cost capability of trade-off .....	40
Shortfalls in nuclear-trained personnel .....	41
Recapitulation: A cost/capability trade-off .....	41
Chapter VIII—Shipyards and shipbuilding .....	43
Shipyard delivery problems .....	43
Is there enough shipyard capacity for a 600-ship program? .....	48
Chapter IX—The overhaul backlog .....	53
Chapter X—Overview of the President's fiscal year 1977 SCN budget request .....	57
Conclusion .....	59
Footnotes .....	60
Appendix A—Constructing alternative forces .....	67
Appendix A footnotes .....	84
Appendix B .....	86

**ACKNOWLEDGMENTS**



# TABLES

1. Force mix for 600-, 500-, 400-ship navies; comparison with projected levels of September 30, 1976.....	16
2. 600-ship Navy—5-year (fiscal years 1977–81) procurement program.....	23
3. 500-ship Navy—5-year (fiscal years 1977–81) procurement program.....	27
4. 400-ship Navy—5-year (fiscal years 1977–81) procurement program.....	30
5. Procurement program and unit cost differential: CSGN versus DDG-47; 600- and 500-ship options: Title VIII fully implemented.....	36
6. Fuel cost differential: CSGN versus DDG-47; 600- and 500-ship options: Title VIII fully implemented.....	38
7. Operating cost (nonfuel) differential: CSGN versus DDG-47; 600- and 500-ship options: Title VIII fully implemented.....	39
8. Ships delivered after April 1973: Average lags from April 1971 estimate of delivery dates.....	44
9. Comparison of fiscal year 1977 5-year shipbuilding program with fiscal year 1975 5-year program for overlapping fiscal years 1977, 1978, 1979.....	45
10. Potential builders of ships, fiscal years 1977–81 programs.....	50



# APPENDIX TABLES

A. 600-ship Navy : 602/594 vessels.....	78
B. 600-ship option.....	79
C. 500-ship Navy : 514/506 vessels.....	80
D. 500-ship option.....	81
E. 400-ship Navy : 425 vessels.....	82
F. 400-ship option.....	83

## CHARTS

1. Shipbuilding and conversion requests and appropriations.....	6
2. The long-run force.....	17

## MAPS

A. Major new construction and conversion shipyards.....	51
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## SUMMARY

The United States Navy has steadily declined in size over the past eight years, and it now stands at half its 1968 force level. The Congress faces choices which will influence the future size of the Navy. It can elect to reverse the present decline and expand to a level of 600 ships, the force size the Navy itself would prefer. It can seek to maintain the Navy at slightly above its present level of 480 ships. Or it can allow the decline to continue so that the Navy will approach 425 ships by the late 1980s.

For the past decade, the Congress has seemingly favored procurement of large, complex, versatile, and costly nuclear-powered ships. Navy requests for a number of these ships have driven up shipbuilding program costs. These costs also have risen because shipbuilders have been unable to complete ships on time and at agreed upon prices. Delivery lags of 18 months or more have increased lead times to eight years for carriers and six years for other major warships, and therefore have subjected ship procurement to greater than anticipated inflationary costs. Faced with rising costs, the Navy has had to settle for a smaller fleet in order to pay for nuclear power in some of its ships and to obtain quality improvements in them and others. It has retired many of its older ships left over from World War II, thereby saving associated maintenance costs. These costs also have risen over the past decade and have led to the growth of overhaul and maintenance backlogs and a deterioration of fleet readiness.

In deciding the size of the Navy, the Congress may want to consider its present missions, the threat it faces, and the assistance it receives from U.S. Allies. The Navy's missions have not fundamentally changed over the past 20 years. Its tasks are still to maintain control of the seas, project U.S. power ashore, and maintain an overseas presence during peacetime. On the other hand, the Soviet Navy has evolved into a more capable force, with greater firepower and range. The Soviet Union has rapidly expanded the range and tempo of its overseas deployments during the past decade. U.S. Allies contribute a significant number of ships which are deployed primarily in coastal waters and are designed for mine and antisubmarine warfare. With a few exceptions, however, the Allied contribution is of uncertain quality and limited range. In addition, the Allies are not committed to assist the United States in many situations in which U.S. interests are significantly affected.

Arguments for an expanded Navy of about 600 ships would stress the growing Soviet naval threat, particularly in areas where U.S. interests and activities previously were unopposed. They would point to enhanced offensive capabilities of both Soviet submarines and major warships. A 600-ship force level with more carrier task forces (14 total) would

provide greater assurance that the U.S. Navy could perform its assigned tasks.

Arguments for a 500-ship force level would assert that the U.S. Navy would have continued superiority over the Soviet Navy even at that lower level. According to this view, international developments would allow for some reduction of U.S. naval presence abroad. Five hundred ships with 12 carrier task forces would be adequate for the Navy's deployment needs. Expansion beyond 500 ships would impose an unnecessary strain on the budget as a whole, to the detriment of pressing needs in other areas.

The 400-ship alternative would be favored by those who believe that the Soviet Navy is still primarily intended to defend the homeland from sea-based attacks. In addition, it is argued, the United States could considerably reduce its overseas commitments, especially in Asia, and cut back on naval deployments accordingly. It could also cease to plan for a protracted antisubmarine warfare (ASW) campaign, which demands more ships than likely would be necessary given the present uncertainty about how long a European war would go on. A 400-ship level, with ten carrier task forces and a sharply reduced shipbuilding program, would impose fewer strains on the budget and release funds for other needs. Nevertheless, it would meet the demands of a Navy whose missions would be reoriented to the change in America's overseas posture.

The average annual costs of the alternative shipbuilding programs are shown below.

SHIPBUILDING COSTS FOR ALTERNATIVE FLEET SIZES AND  
PRESIDENT'S PROPOSAL  
(Billions of 1976 dollars, fiscal years 1977-81)

<u>Navy Force Goal</u>	<u>Average Annual Cost</u>
500 Ships	4.4
(All Nuclear Major Escorts)	(5.8)
400 Ships	2.2
(All Nuclear Major Escorts)	(3.2)
600 Ships	7.6
(All Nuclear Major Escorts)	(8.6)
President's Proposal	4.5

The table indicates that Title VIII (nuclear-powered major combat vessels) significantly affects the costs of each alternative. Thus the Congress may wish to reconsider whether to procure only nuclear-powered strike cruisers to escort carrier task forces or to procure a

mix of both conventionally powered destroyers and strike cruisers to fulfill the same role. Cost comparisons between the two types of ships reveal that the all nuclear escort force not only is more expensive to build, but also to fuel, maintain, and operate, even allowing for its greater capability and allegedly reduced support ship needs. These comparisons appear in tables 5, 6, and 7 of the text.

Each of the alternative force level programs is compatible with present U.S. shipbuilding capacity, even if Title VIII is fully implemented. Manpower limitations would not restrict the ability of yards to take on additional work as part of an expanded Navy program.

Navy overhaul and maintenance programs affect fleet readiness and possibly also shipbuilding capacity. Emphasis on intermediate level maintenance, particularly tender and base maintenance, could ease the shipyard workload and release greater capacity for work that really must be done in shipyard.

The President's fiscal year 1977 budget request did not directly address most of these issues. The funding request for 16 ships is consistent with a desired level of 500 ships. The proposed budget is ambivalent toward the Title VIII program although the Secretary of Defense appears to advocate a long-term nuclear/nonnuclear mix in roughly one-third/two-thirds proportions, though at lower levels for the five-year program. Funds are requested both for a nuclear-powered strike cruiser and a conventional guided missile destroyer (DDG-47). The budget also provides little relief for the overhaul backlog which once again is not fully funded. The request therefore seems to imply temporizing to permit internal debate on the Navy's future to continue for at least another year. In the meantime, further delays and rising shipbuilding costs, as well as the continued existence of the overhaul and maintenance backlogs, will continue to hamper the Navy's development and capability.





## CHAPTER I

### INTRODUCTION

As recently as 1970 the U.S. Navy had over 950 ships; as of late 1975 it had just over half that figure. This major contraction was due in large part to bloc obsolescence of ships left over from World War II, as well as to a decision by the Navy to spend available funds on fewer, but more capable and versatile vessels. The Navy's missions and its pattern of peacetime ship deployments have remained virtually the same over the past decade. At the same time, the Soviet Navy has considerably improved its capabilities and its range of operations. It is uncertain as to how much the improvement in Soviet naval capabilities affects the U.S. Navy's ability to carry out its missions; that is, whether the U.S. Navy still maintains a margin of overall superiority despite its reduced size. The major issue is, therefore, the direction naval force levels should take, in view of the perceived naval balance with the USSR (taking account of the different missions of the two navies) and in light of budgetary constraints upon shipbuilding and conversion (SCN) funds.

#### No Clear SCN Budgetary Policy During 1970s

Over the past seven years, the Navy has responded somewhat inconsistently to the decline in the number of its ships. The size of a given shipbuilding and conversion (SCN) budget affects the remainder of future Navy budgets, particularly manpower, operations and maintenance, and aircraft and weapons procurement. Since 1970 these SCN requests have increased and decreased in successive years until 1976. The fiscal year 1976 SCN budget request, which included funds for cost growth in fiscal year 1975 and prior year programs, actually represented the second consecutive decline in constant dollar value of money requested for new shipbuilding authority. However, the fiscal year 1977 SCN budget seeks once again to reverse the trend. Funds requested for new shipbuilding represent about a 52 percent increase over the previous fiscal year's request, which itself was a 22 percent decline from that of fiscal year 1975.

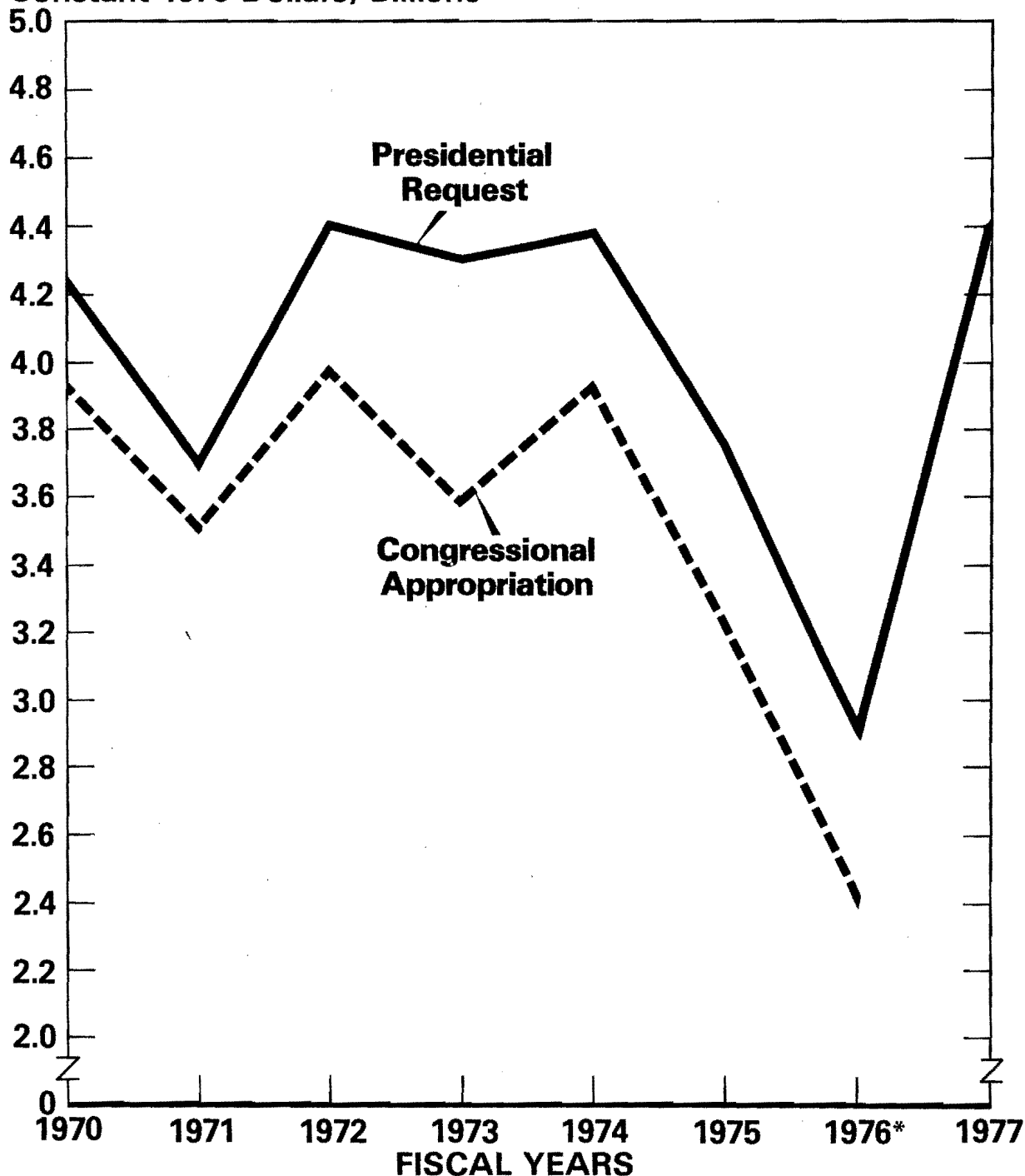
Congressional action, while approving reduced new obligational authority each year, has maintained the up-and-down nature of Administration SCN requests. Congressional SCN appropriations for fiscal year 1976 and the transition quarter would represent a decline of 28 percent from the previous year. The fiscal year 1977 Administration request constitutes an increase of 82 percent over Congressional action for the previous year (see Chart 1).

(5)

Chart 1.

# Shipbuilding and Conversion Requests and Appropriations (Budget Authority, Fiscal Years 1970-77)

Constant 1976 Dollars, Billions



\* 15 month total over 12 month period

NAVY SHIPBUILDING AND CONVERSION PRESIDENTIAL REQUESTS  
FISCAL YEARS 1970-77  
(Millions of dollars; requests for prior year cost  
growth excluded)

	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976<sup>a</sup></u>	<u>1977</u>
Current \$	2,698	2,579	3,329	3,564	3,902	3,563	2,921	4,667
Constant (1976) \$	4,247	3,693	4,403	4,323	4,387	3,759	2,903	4,406
Number of Ships	19	14	19	20	14	30	23	16

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a. Fifteen-month totals expressed in terms of 12-month request.

NAVY SHIPBUILDING AND CONVERSION CONGRESSIONAL APPROPRIATIONS  
FISCAL YEARS 1970-76 AND 1977 REQUEST  
(Millions of dollars; appropriations for prior year  
cost growth excluded)

	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976<sup>a</sup></u>	<u>1977<sup>b</sup></u>
Current \$	2,496	2,448	3,005	2,957	3,493	3,059	2,437	4,667
Constant (1976) \$	3,929	3,505	3,975	3,587	3,927	3,227	2,420	4,406
Number of Ships	14	15	16	10	14	22	18	16

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a. Fifteen-month totals expressed in terms of 12-month request.

b. President's request.

Increase in Cost Growth in Fiscal Year 1977 Budget

The fiscal year 1976 and fiscal year 1977 SCN requests contained requests for cost growth in earlier year SCN programs amounting to \$2,269 million and \$1,532 million (in 1976 dollars) respectively. At the time of its submission, the 1976 request was represented as fully funding SCN cost growth; however, the 1977 request, which seeks to cover the unappropriated balance of the fiscal year 1976 request (\$992 million), exceeds that amount by \$540 million.

## Resource Constraints upon Naval Expansion

Resource constraints have limited naval expansion. In the 1960s it was not unusual for Congress to appropriate funds for almost (if not exactly) the number of ships that the Navy requested (e.g., 1961-63, 1967-68). On one occasion (1965) Congress appropriated funds for more ships than the Navy had asked for. Congress also took the lead in appropriating funds for nuclear-powered ships, primarily submarines and frigates, over and above the Navy request (1966-68), although these ships involved greater procurement costs than their conventional counterparts. By 1970 it became clear that the Navy would not be able to command the large appropriations necessary to maintain a 900-ship fleet with the most technologically sophisticated vessels and weaponry, including a significant number of nuclear-powered ships.

Faced with this problem, the Navy followed a policy that reflected the pattern of Congressional appropriations in the late 1960s. It elected to have a smaller fleet with greater all-round capabilities and with relatively large vessels--many of them nuclear, all of them with the most advanced technological developments. Most of the World War II vintage ships were retired, thereby achieving economies in maintenance costs.

## Shipbuilding Difficulties and the Overhaul Backlog

The problem of a declining, but ever more costly, fleet has been compounded by the growth in lead times for ship delivery and by the growing backlog of ships due for overhaul. The time lag between authorization and commissioning of ships now extends nearly eight years for carriers. Other major lead warships (i.e., first off the production line) are now commissioned approximately six years after authorization. In general, contractors have fallen 12, and often as much as 18 or more months behind their contract delivery estimates. Longer lead times have imposed greater than anticipated inflation costs and thus led to further cost growth. The maintenance backlog was a result of the extended service of ships on station during the Vietnam War. The duration of the conflict and shortage of overhaul funds prevented adequate ship maintenance and brought about a decline in warship capability. Deferrals of overhaul and maintenance soon translated into backlogs which continued to grow in the 1970s.

## Factors in Analysis of Naval Force Alternatives

This paper outlines alternative force levels of 600, 500, and 400 ships, as examples of naval force level policies that, respectively, seek an expanded, relatively stable, or reduced fleet size. In framing these alternatives, it is necessary to assess the missions assigned the forces and the threat against which they would be directed. These

missions, the threat, and the contribution of Allied fleets, which also enters the calculation of force needs, are analyzed in Chapter II. The cost of each program (Chapters III-VI) is crucial to the analysis. So too is the impact of a policy geared to an all nuclear surface fleet as prescribed in Title VIII of the 1975 Defense Appropriation Authorization Act, which is discussed in Chapter VII. Equally important to the analysis is the program schedule: the ability and capacity of the shipyards to meet the shipbuilding timetables that are set for them (Chapter VIII). Finally, the existing fleet material condition, and therefore overhaul backlogs, affects force level (Chapter IX). The building program not only must add new ships to existing force levels, it also must replace vessels that are too old or otherwise unfit for sustained operations. This paper concludes with a brief discussion of the President's budget, in light of the analysis of alternate force levels (Chapter X).



## CHAPTER II

### BACKGROUND: REDUCTION OF U.S. NAVY DESPITE UNCHANGED MISSIONS AND INCREASING CAPABILITY OF SOVIET NAVY

#### Major Navy Missions Unchanged

The U.S. general purpose Navy presently lists as its primary war-time missions those of "sea control" and "projection of power" ashore. It also considers "presence" to be its major peacetime mission. "Sea control" is the ability to ensure relatively unhampered use of the seas by one's own forces. It also implies a capability to deny to the enemy the use of the sea. "Power projection" implies the ability to launch air and/or ground attacks from sea-borne vessels into hostile areas ashore. In order for the Navy to be able to project its power under fire, it must control the surrounding seas from threats to itself. "Presence," the only wholly peacetime-related mission of the three, is the ability to maintain a show of U.S. force in key overseas areas. Its purpose is to deter actions that may be hostile to American interests, project a stabilizing influence during crises, and provide a visible assurance of our commitments to our Allies.

At the end of World War II, the United States boasted the world's largest and most modern Navy. It had been virtually totally reconstructed after Pearl Harbor, and its major warships--carriers, cruisers, destroyers, and submarines--were still coming out of the shipyards in sizable numbers through 1947. The U.S. Navy dominated the seas and, with a force level of about 1,000 ships (briefly reduced and then built up in the early 1950s) made a major contribution in both the Korean and Vietnam Wars--primarily by means of projecting air power from its carriers. It also served as a base for the projection of ground forces in such varied areas as Korea (1950), Lebanon (1958), and the Dominican Republic (1965).

The Navy's perceived wartime missions have not changed to keep pace with the decline in force size. Indeed, the Navy has continued to insist that a force level of at least 800 ships is necessary to ensure a minimal risk against any threat.<sup>1</sup> When Secretary of Defense Melvin Laird proclaimed in 1970 that the United States could not and would not maintain a posture that allowed it to pursue simultaneously major wars in Europe and Asia, as well as deal with a minor contingency elsewhere, he did not seem to include the Navy's role in his observations. The reduction in America's profile and presence seemed limited to ground forces, while the Navy and its air wings had to be present and available in Asia to help our Allies help themselves.<sup>2</sup> Four years later, Secretary of Defense James R. Schlesinger stated unequivocally that the Navy's fundamental role had not changed under the "one-and-one-half war" strategy:

The change in strategic concept has accompanied the reduction in the baseline general purpose forces. The principal change was the reduction in the number of active Army divisions from 16-1/3 in 1964 to 13 in 1973....Although the number of naval combatants has also declined substantially, the result is more a function of budgetary constraints and the retirement of obsolescent ships than of the change in strategy.<sup>3</sup>

### Development of Soviet Offensive Naval Capability

The continued growth of Soviet naval capabilities has added to concern about decline in the size of the Navy. The Soviet Navy is apparently no longer geared merely to protection of the Soviet homeland and its coastal waters, as were Soviet Navies under Stalin. Indeed, it has gone beyond the sea-denial, anticarrier mission, as emphasized under Khrushchev. Instead, possibly as an outgrowth of its search for sophisticated naval defenses against a Western threat, possibly motivated by longer-term goals of force capability, the Soviet Navy has reached the threshold of a capability to project and sustain military power at a distance from its homeland. Increasing sophistication and endurance in Soviet ships and weaponry accompanied the extension of Soviet forward deployments.

### Composition of the Soviet Fleet

The Soviet fleet presently numbers over 550 major combatant vessels of which 300 are submarines, including 68 tactical cruise missile submarines. By comparison, the United States numbers 250 major warships, including 64 nuclear submarines. For the first time in over two decades the Soviet Navy has undertaken a program of aircraft carrier construction. At present, three mid-sized, conventionally powered Kiev-class carriers suitable for vertical short take-off and landing (VSTOL) aircraft or helicopters are at various stages of production or sea trials; others may follow. In addition, two Moskva-class helicopter carriers have been operational since the late 1960s. The Soviet Union has steadily replaced diesel submarines with nuclear-powered vessels, although not on a one-for-one basis. It continues to produce impressively large, fast, and heavily armed major surface vessels (such as the Kara-class missile cruiser). All of these developments point to emergence of new Soviet naval missions, possibly akin to our own sea control and projection missions.

### Expansion of Soviet Overseas Presence

The Soviet Union has maintained an increasingly visible naval presence in the Mediterranean and Caribbean Seas and in the Atlantic, Indian, and Western Pacific Oceans. It has benefitted from base facilities at Berbera, Somalia; and Cienfuegos, Cuba. In addition, it has



constructed a canal linking the White and Baltic Seas, which would allow the Soviet Baltic fleet access to the Atlantic Ocean, even if the Danish straits are sealed by Allied forces.

Finally, and possibly in conjunction with its presence in more distant waters, the Soviet Union has sought to improve the effectiveness of its naval infantry (marines). The Soviet Naval Infantry presently numbers some 10,000 men. Their historical mission has been geared toward "prolonged river crossings" and naval base defense for which they utilized small landing craft. While the Soviet Naval Infantry cannot be compared with the U.S. Marine Corps, it is apparently being reoriented toward amphibious missions of a type traditionally associated with U.S. amphibious operations.

#### Limitations of Soviet Naval Power

It must be noted, however, that Soviet capabilities do not match those of the U.S. Navy in several respects. The United States possesses far more tactical air firepower; it presently outnumbers the Soviets by 13 operational aircraft carriers to none and by 7 helicopter carriers to 2. The new Soviet aircraft carriers when operational will launch only vertical short take-off landing (VSTOL) planes, whose range and other capabilities are inferior to those of advanced U.S. naval fighters. Nor can the Soviet carriers match their American counterparts, particularly the new nuclear carriers, in size, sustained speed, or range. Although they possess in themselves less initial firepower than similar Soviet vessels, other major American surface warships are more suitable for protracted sea hostilities when operating as part of a carrier task force. U.S. amphibious assault forces far outnumber the Soviet naval infantry. U.S. amphibious assault vessels are larger, faster, and carry greater loads than their Soviet counterparts. The Soviet Union is only beginning to alter its traditional amphibious mission orientation to one comparable to that of the U.S. Navy. Finally, Soviet ships are not capable of the rapid underway replenishment capabilities of U.S. task force operations, a key ingredient for sustaining operations in areas remote from the homeland.

#### Allied Naval Contribution Difficult to Ascertain

The Allied contribution to Western defense is an additional factor that enters an assessment of U.S. needs in response to its missions and the Soviet threat. The combined Allied navies, particularly in Western Europe, account for over 240 major surface combatants and about 140 submarines. The corresponding Warsaw Pact contribution to the Soviet naval effort is negligible. However, although quantitatively significant, the Allied contribution to Western naval defense is difficult to assess because of its contingent nature. The Allies--both in NATO as well as in the Pacific (SEATO, ANZUS, and bilateral treaty partners)--are primarily able to contribute a mine warfare and antisubmarine

warfare (ASW) capability. Their primary mission is to increase the protection of convoys as well as control key geographic "choke" points in order to limit additional Soviet fleet deployment after the onset of hostilities. However, examination of the present mix of Allied naval forces<sup>4</sup> reveals that, with the possible exception of the British, French, and perhaps Italian Navies, Allied capabilities are geared primarily to coastal defense. Protection of the major portion of sea lanes throughout hostilities thus seems to fall to the U.S. Navy. Secondly, a close look at Allied navies reveals that many of their ships are older American vessels which have been modernized, but which cannot match the capabilities of more recently constructed and technologically advanced ships.

A final question mark hanging over the nature of the Allied contribution is that of the peacetime commitment of their naval forces. The treaties which bind us to our Allies do not demand their active participation other than in mutually perceived threats to the signatories' security or actual hostilities emanating from those threats. However, a major tenet of U.S. national security policy has been to contain crises before they spread to general war; that is the essential purpose of peacetime presence. As events during the October, 1973, Mideast crisis made quite clear, our Allies, in looking to their own interests, may very well prefer to adhere to the letter of their treaties and avoid involvement in crises. This leaves the United States to carry the burden of crisis control unilaterally. That task becomes even more difficult if a superior force to that of any possible adversary must be available on station, in order to forestall the temptation by powers great or small to achieve a fait accompli, whether militarily or by means of applying pressures upon third parties.

## CHAPTER III

### ALTERNATIVE FORCE LEVELS: INTRODUCTION

The current debate on appropriate force levels for the Navy's missions acknowledges that present fiscal constraints and the international situation make it doubtful that a consensus can be reached for having a Navy so large as to imply a "minimal risk." Because of differing views of the magnitude of the risk, and the need to accept some risk, it is necessary to examine various strategies to minimize it within given constraints. The 600-, 500-, and 400-ship alternatives outlined below and illustrated in Table 1 address changes that are feasible over the next decade depending on the degree of budgetary constraint. Each alternative is presented in the context of a national security policy orientation to which it might relate most closely.

#### Choosing an Alternative Size

Barring a radical transformation of what the U.S. Navy views as an appropriate mix of ships, several factors determine the size of the fleet. These are primarily the number of carriers, amphibious assault ships, and submarines. The most important factor is the number of aircraft carriers. The number of carriers determines the number of carrier escorts; together they have a major impact on the required number of fleet replenishment vessels, which in turn demand escorts of their own.

Title VIII affects carrier escort requirements. This paper adopts the Navy view that four nuclear escorts are sufficient for an all nuclear carrier task force, whereas six conventionally powered escorts are required. Were Title VIII fully implemented, all carriers and their escorts would, in the long run, be nuclear powered. If Title VIII were only partly implemented, some escorts would be conventionally powered, even in the long run, although eventually all carriers would be nuclear. Long-run naval force structure is illustrated in Chart 2. Conventional escorts and carriers already in the fleet will not all be retired until at least the 1990s. In addition, nuclear-powered escorts have not been procured in multiples of four per nuclear carrier, to allow for a set of complete task forces. Both the Title VIII and non-Title VIII options included within each alternative in this paper are based on estimates of possible Navy programs which likewise will not yield an exact number of nuclear escorts for all present or projected nuclear carriers. Thus the number of escorts will not merely be a function of the number of carriers alone, but will also have to account for the projected number of available all-nuclear task forces of four escorts each, with other task forces comprised of six conventional escorts each.

TABLE 1

FORCE MIX FOR 600-, 500-, 400-SHIP NAVIES  
COMPARISON WITH PROJECTED LEVELS OF SEPTEMBER 30, 1976

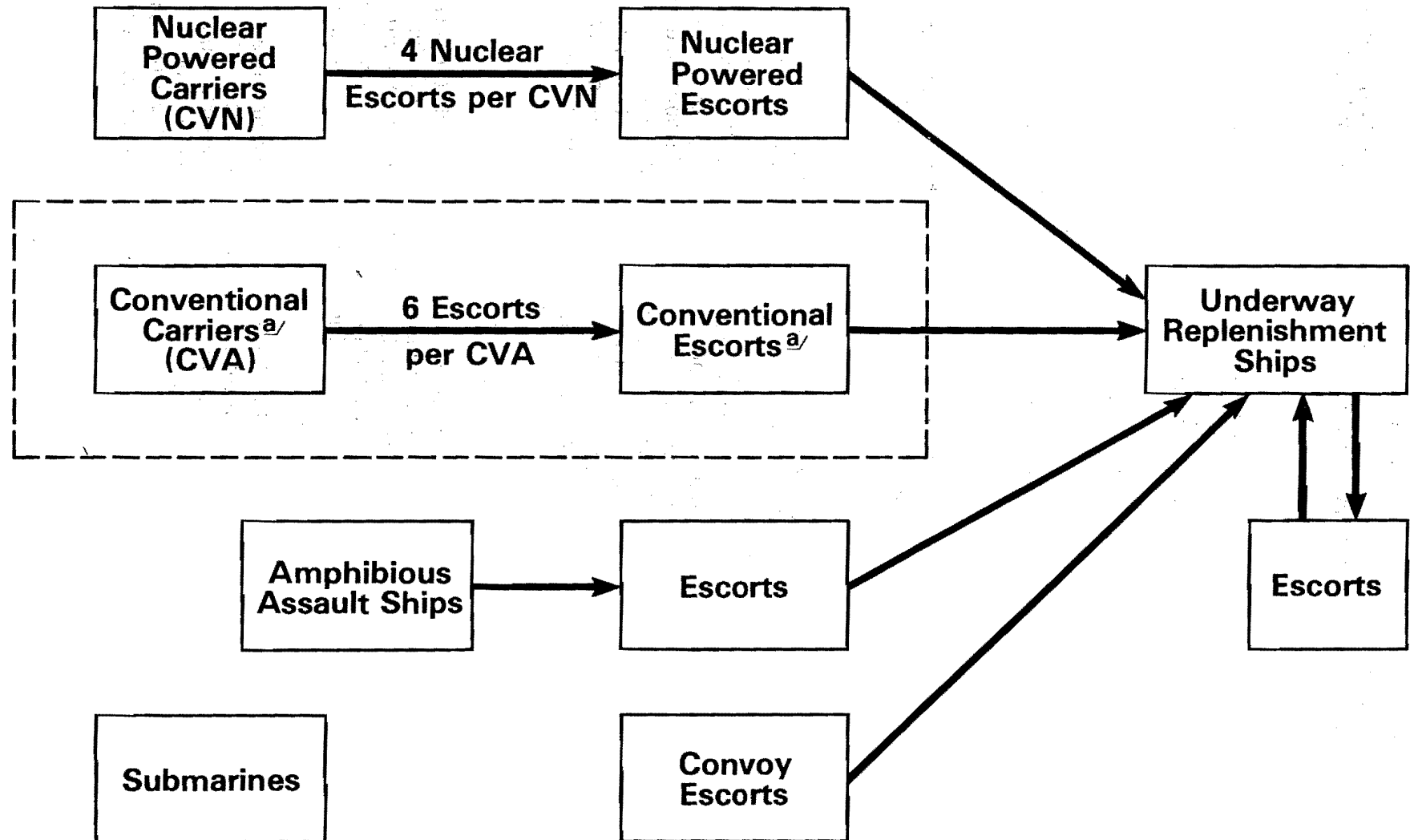
<u>Category</u>	<u>9/30/76 Estimate<sup>a</sup></u>	<u>600 Ship</u>	<u>500 Ship</u>	<u>400 Ship</u>
Carriers	13	14	12	10
Major Fleet Escorts	180	222 (214 <sup>b</sup> )	197 (189 <sup>b</sup> )	164
Nuclear Attack Submarines	65	95	82	82
Amphibious Assault Ships	62	69	65	54
Underway Replenishment Ships	44	60	46	37
Patrol Vessels	11	11	11	6
Support Ships	60	52	39	30
Mine Countermeasure Ships	None	15	10	None
SURTASS Ships	None	12	None	None
Miscellaneous	<u>14</u>	<u>11</u>	<u>11</u>	<u>10</u>
Subtotal	449	561 (553 <sup>b</sup> )	473 (465 <sup>b</sup> )	393
Ballistic Missile Submarines	<u>41</u>	<u>41</u>	<u>41</u>	<u>41</u>
TOTAL	490	602 (594 <sup>b</sup> )	514 (506 <sup>b</sup> )	434

a. Estimates for first four categories: Secretary of Defense Donald H. Rumsfeld, Report to the Congress on the FY 1977 Budget and Its Implications For the FY 1978 Authorization Request and the FY 1977-1981 Defense Programs (January 27, 1976). Other estimates are calculations based on projected retirement and present force levels.

b. Full implementation of Title VIII.

Chart 2.

## The Long-Run Force



<sup>a/</sup> Forces shown within the broken line box would not apply if Title VIII were fully implemented.

If the Navy buys all nuclear-powered escorts for carriers, it will have to buy fewer within each alternative force (see table below). Other escort requirements will not vary with Title VIII, which only affects major combatants.

	<u>600 Ships</u>			<u>500 Ships</u>			<u>400 Ships</u>		
	<u>CVs</u>	<u>CV Esc</u>	<u>All Esc</u>	<u>CVs</u>	<u>CV Esc</u>	<u>All Esc</u>	<u>CVs</u>	<u>CV Esc</u>	<u>All Esc</u>
Non-Title VIII	14	76	222	12	68	197	10	56	164 <sup>a</sup>
Title VIII	14	68	214	12	60	189	10	52	164 <sup>a</sup>

- a. The 400-ship option provides only for the procurement of major warships; Title VIII therefore does not result in lower procurement levels or a lower force level.

Estimates of the actual number of vessels that are to be constructed depend on the present size of the fleet and the number of vessels likely to be retired by the mid-1980s. Tables 2, 3, and 4 all assume that, apart from support and replenishment ships, vessels over 7,500 tons have a 30-year life expectancy; between 2,500 and 7,500 tons, 25 years; less than 2,500 tons, 20 years; and all submarines, 25 years. Support and replenishment vessels are assumed to have a useful life of 35 years if over 7,500 tons and of 30 years if between 5,000 and 7,500 tons. It is noteworthy that despite their longer life expectancies, support vessels comprise a large proportion of ships that have reached replacement age.

#### Possible Directions for Further Analysis

The following alternatives differ as to the force level of the fleet; they vary only marginally on its mix and mission. Perceptions of the threat as it will materialize over the next two decades and of the future stability of international relations generally will, as noted above, condition the response to the Navy's call for higher force levels, whether around the 500- or 600-ship mark.

Common to all three alternatives is the acknowledged importance of both the sea control and projection missions. All are geared to cope primarily with an extended war in Europe--at least several months--whereby the fleet would protect convoys of men and materiel which would begin to arrive some 30 days after the commencement of hostilities and would continue to come in greater numbers until the war's end. The carriers themselves, whatever their projected numbers, would first beat back

conventional enemy air and sea attacks and then project their air power into the land-based theater.

There is a question as to whether the carrier should continue as the sole backbone of the Navy in its future missions. Carriers are the highest value seaborne target against which an enemy could aim. They represent the most intensive units of firepower afloat, not to mention the expenditure of billions of dollars. However complete a defense they may have, there is some doubt as to whether they can survive a naval conflict unscathed. Given the limited number of carriers which even the highest option projects, the immobilization of a few of them would pose serious problems for a Navy seeking to maintain a two-ocean posture, and seeking to extend the battle from the ocean to land. Furthermore, arguments for the carrier's invulnerability tend to be made in terms of its own systems and the fact that escorts help to defend it in depth, thus raising questions about its ability to perform its air projection mission. If carrier planes, helicopters, missiles, and guns are preoccupied with assuring the carrier's safety, they can hardly be released for land use. Attrition will certainly take place during such an engagement, and further reduction of available aircraft will result from the need to maintain some protection for the carrier in case of future attacks--assuming the carrier survives the first one. The number of planes actually available from a given carrier for a projection mission is thus subject to considerable uncertainty.

The assertion that a carrier can survive a sea battle rests primarily on the assumption that that battle will not be fought with nuclear weapons. Yet the Soviet warship configuration seems to point to their being designed primarily for employment of a nuclear capability against the carrier. As noted above, the Soviet surface fleet emphasizes weaponry and deemphasizes crew comfort and survivability factors. If the fleet's first shot is to be its last shot, it is reasonable to expect that an attempt will be made to maximize the damage it will inflict. Should the Soviet first shots be nuclear, it is unlikely that any of their targets will survive. Navy planners prefer to view nuclear war at sea in the context of a wider nuclear conflict. On the other hand, the Soviets might reason that the sinking of carriers by nuclear means, and in the context of a conventional land war, would not necessarily provoke an American nuclear response on land. In these terms, the contribution of carriers to a land war becomes even more questionable; they may not survive to make that contribution.

Yet another question revolves around the expected length of a European war to which the Navy proposes to contribute. Admiral Holloway has emphasized the importance of sealift in the first few months of conflict, but uncertainty remains about how much sealift can be pushed through in the crucial first month of the war, before Soviet forces can be destroyed or pushed back.<sup>5</sup> It might be asked whether a carrier-based fleet, preoccupied initially with its own defense, could make a meaningful contribution to the land-based Allied effort in the onset of

hostilities, which might be the most intensive of a Soviet-initiated conflict,<sup>6</sup> however long it ultimately may endure.

A third question arises from the peacetime threat which the Soviet fleet might pose in the next two decades. It may well be that the growing thrust of future Soviet naval operations will be on an overseas presence. They may seek to assist revolutionary groups engaged in civil wars by neutralizing outside intervention in favor of pro-Western forces. The Soviet search for overseas bases may be part of this strategy. Overthrow of neighboring regimes by pro-Soviet forces, especially regimes controlling raw material supplies crucial to Western security, could help fulfill the Soviet intentions in a more sophisticated and less risky way. These materials could be denied at source, and pressures brought to bear on Western Europe in particular in conjunction with such denial. The Arab oil embargo showed that a denial of raw materials significantly affected the cohesion of the Atlantic Alliance. Several analysts have pointed to the possibilities offered by a sophisticated use of "naval suasion" or "gunboat diplomacy."<sup>7</sup> If the Soviets seek to refine this art and act upon it, it could be asked whether a U.S. fleet as presently constituted could appropriately respond to this new peacetime threat.

One could infer from the preceding observations that it might be useful to add depth to the present debate on naval alternatives to include additional considerations, particularly in view of the fact that a Navy built for the 1980s will continue to function into the 21st century. It might be fruitful to append questions of ship size, speed, and armament to those of force level. Carriers, still the crucial element in the fleet, might nevertheless come to share their primary role with other, newer types of highly capable, fast vessels. Even if nuclear powered, carriers might remain large--e.g., Nimitz class--or they might be deemed more useful to the Navy of the nineties if they were smaller, and perhaps more numerous. Escorts could be provided with nuclear propulsion to add to their deployment capabilities, or they might benefit from the hover-craft/air-cushion technology that is being applied to the Surface Effect Ship (SES). In this context, stepping up the R&D effort, to achieve new and more effective offensive weapons systems, as well as capable planes that could be based on smaller ships, might also contribute to maintaining naval capabilities into the next century.



## CHAPTER IV

### ALTERNATIVE FORCE LEVELS: A 600-SHIP FLEET

#### Toward a 600-Ship Force Level

The customary rationale for the Navy's mission is that it is geared to America's primary interests as a maritime nation. It emphasizes protection against the submarine threat to convoys between America and her Allies in Europe and Asia and from sources of increasingly vital raw materials to the United States, Western Europe, and Japan. It also stresses the Navy's need to assure its capability to project U.S. air and ground power from naval vessels in the European and East Asian theaters. The Chief of Naval Operations is on record in support of a force level of about 600 ships.<sup>8</sup> He has stated this would be the minimum he would need for reasonable assurance of carrying out his assigned mission of protecting the sea lanes and projecting an adequate peacetime presence in the face of a growing Soviet threat. At 600 ships, the Navy would be capable of carrying out missions in support of the one-and-one-half war strategy applicable to other branches of the general purpose forces.

Advocates of building a larger fleet point out that the missions assigned to the U.S. Navy in such a case are more demanding than those which would fall to the Soviet Navy. The latter can succeed merely by playing the spoiler's role and preventing the U.S. Navy from carrying out its tasks. Thus, a Soviet fleet that approaches qualitative parity with U.S. forces could successfully disrupt the Allied naval mission, as well as have the potential for action in distant theaters.

#### Growth in Number of Carrier Task Forces

The focal point of an enlarged Navy would remain the aircraft carrier. In line with official Navy pronouncements, it would continue to serve as the key element of American sea-control strategy and as a floating base for the projection of U.S. air power. A level of 14 carrier task forces would, in most circumstances, provide a credible deterrent against adventures by the Soviet or any other navy. Two carriers would be permanently on station in the Atlantic/Mediterranean area and two more would be on station in the West Pacific to counter possible Chinese or Soviet threats against Japan and South Korea. The growth in task force numbers would permit the Navy to maintain a surge capability to five carriers in both oceans.

As Table 1 indicates,<sup>9</sup> the number of major fleet escorts would likewise rise. The increase would be due not only to the need to provide escorts for an additional task force, but also for an expanded amphibious

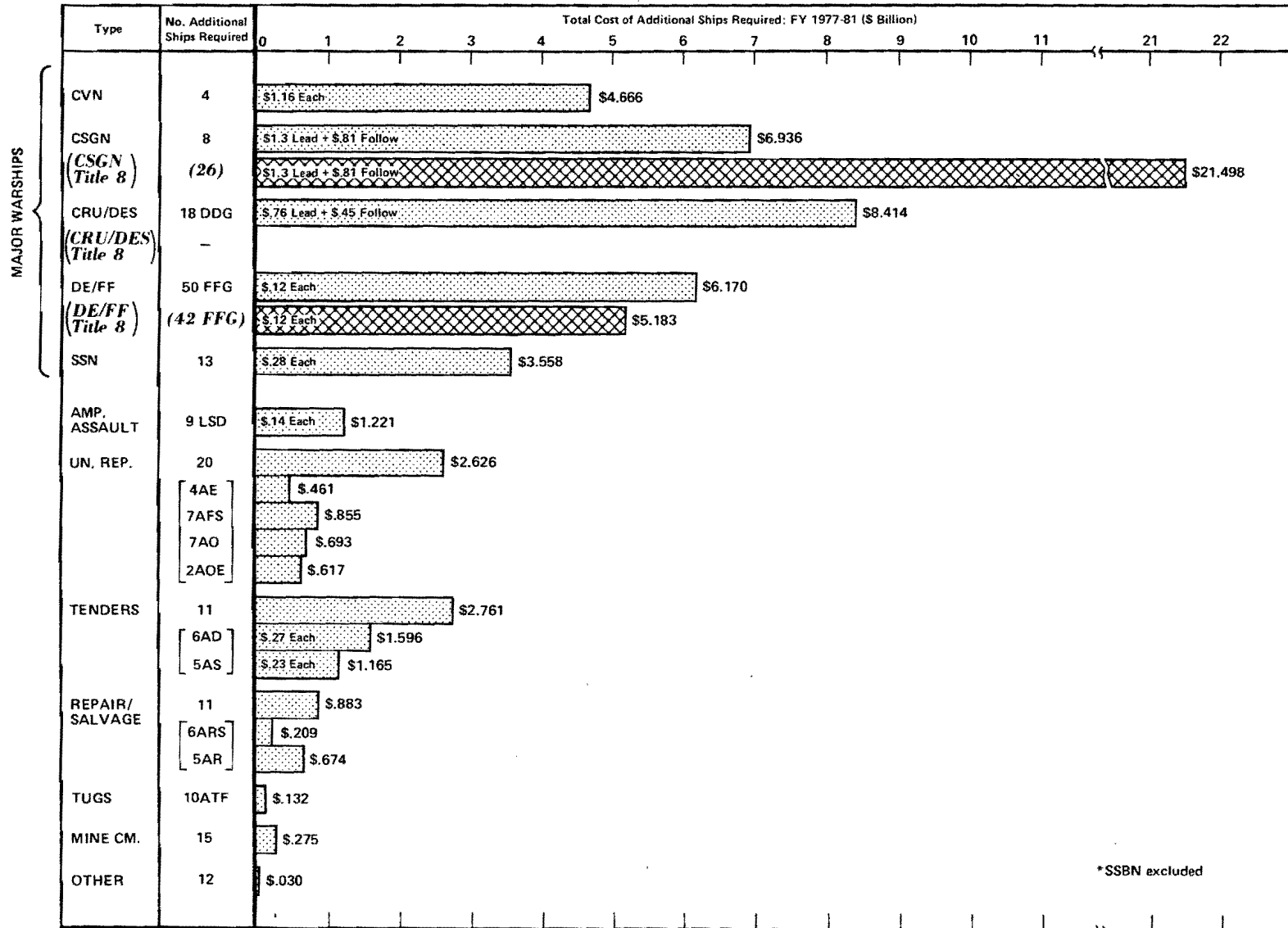
assault fleet capable of landing a full 1-1/3 Marine divisions, for an augmented underway replenishment force, and for greater antisubmarine capability. Under this option, carriers procured in fiscal years 1977-81 would be nuclear powered. Similarly, some, and perhaps all, of the carrier escorts added to the fleet in those fiscal years would have nuclear propulsion. Should all 26 escorts procured be nuclear powered, the cost of the escort program alone would exceed \$21 billion (in constant 1976 dollars) for the five-year period (see Table 2). On the other hand, if 18 conventionally powered AEGIS guided missile destroyers were substituted for some strike cruisers, the cost for an equivalent ship buy would be about \$14 billion.<sup>10</sup> Table 2 shows the impact of Title VIII on the costs of the strike cruiser, DDG-47, and FFG programs. It also shows that were Title VIII fully implemented, eight fewer FFGs need be procured.

#### Proposed Annual Building Rate Twice That of Previous Decade

Table 2 also reveals that a total of 181 ships, including four carriers, would have to be built over five years to reach a 600-ship level by fiscal year 1986, assuming an average lead time of five years for construction.<sup>11</sup> The annual building rate thus averages 36.2 vessels, slightly less than double the 19 ships per annum building rate for the past ten fiscal years. If Title VIII were fully implemented, eight fewer carrier escorts would be required, and the procurement program would total 173 vessels, or 34.6 annually. The President's fiscal year 1977 request for funds for 16 vessels, with no request for carrier funds, clearly would necessitate very large funds for the shipbuilding program in fiscal years 1978-81 should this option be adopted.

TABLE 2

# **600 SHIP NAVY — 5 YEAR (FY 1977-1981) PROCUREMENT PROGRAM\*** **COSTS IN CONSTANT 1976 DOLLARS**





## CHAPTER V

### ALTERNATIVE FORCE LEVELS: A 500-SHIP FLEET

#### A 500-Ship Current Baseline Alternative

Those who call for a sharp increase in the Navy's force level believe that the fleet is approaching the point at which it cannot provide adequate assurance that it can carry out assigned missions in the face of the Soviet threat. Others, however, contend that despite its reduced size the U.S. Navy is superior to its adversary. They add that it can remain so over the next 10 to 15 years, given a prudent program of phased ship construction and retirement. In view of present economic constraints and other claims on budget funds, they argue that a naval force approximating present levels would suffice for the pursuit of America's national security goals while not placing an excessive burden upon her resources.

Proponents of a more modest permanent U.S. naval presence would initially pursue the course outlined by Secretary Schlesinger for fiscal year 1976 in which the Navy would reduce its carrier task forces to 12. Similarly, they would not augment submarine levels once the SSN-688 program has been completed. Present Navy capabilities for supporting just over one Marine Expeditionary Force (MEF)--i.e., over one division--would remain intact. All told, the force level would approximate the 500-ship mark, as seen in Table 1.<sup>12</sup>

Maintaining a 500-ship navy would still involve a sizable ship-building program for fiscal years 1977-81, averaging 18-19 ships per year depending on the degree of implementation of Title VIII. Table 3 indicates that two new carriers would have to be built, both of them nuclear. At least two strike cruisers, also nuclear, would be procured. An additional 22 DDG-47 class destroyers would be procured to deploy the AEGIS area defense system. However, should a program fully in compliance with Title VIII be adopted, the 500-ship option would call for 24 new nuclear-powered vessels.

#### Higher Procurement Costs If Title VIII Is Fully Implemented

As was the case with the 600-ship option, full compliance with Title VIII would lead to a marked increase in procurement costs for a 500-ship navy. Indeed, should Title VIII remain in force under the latter option, its cost would approach that of 600 ships with partial compliance with Title VIII.<sup>13</sup>

SHIPBUILDING COSTS FOR ALTERNATIVE FLEET SIZES  
(Billions of 1976 dollars, fiscal years 1977-81)

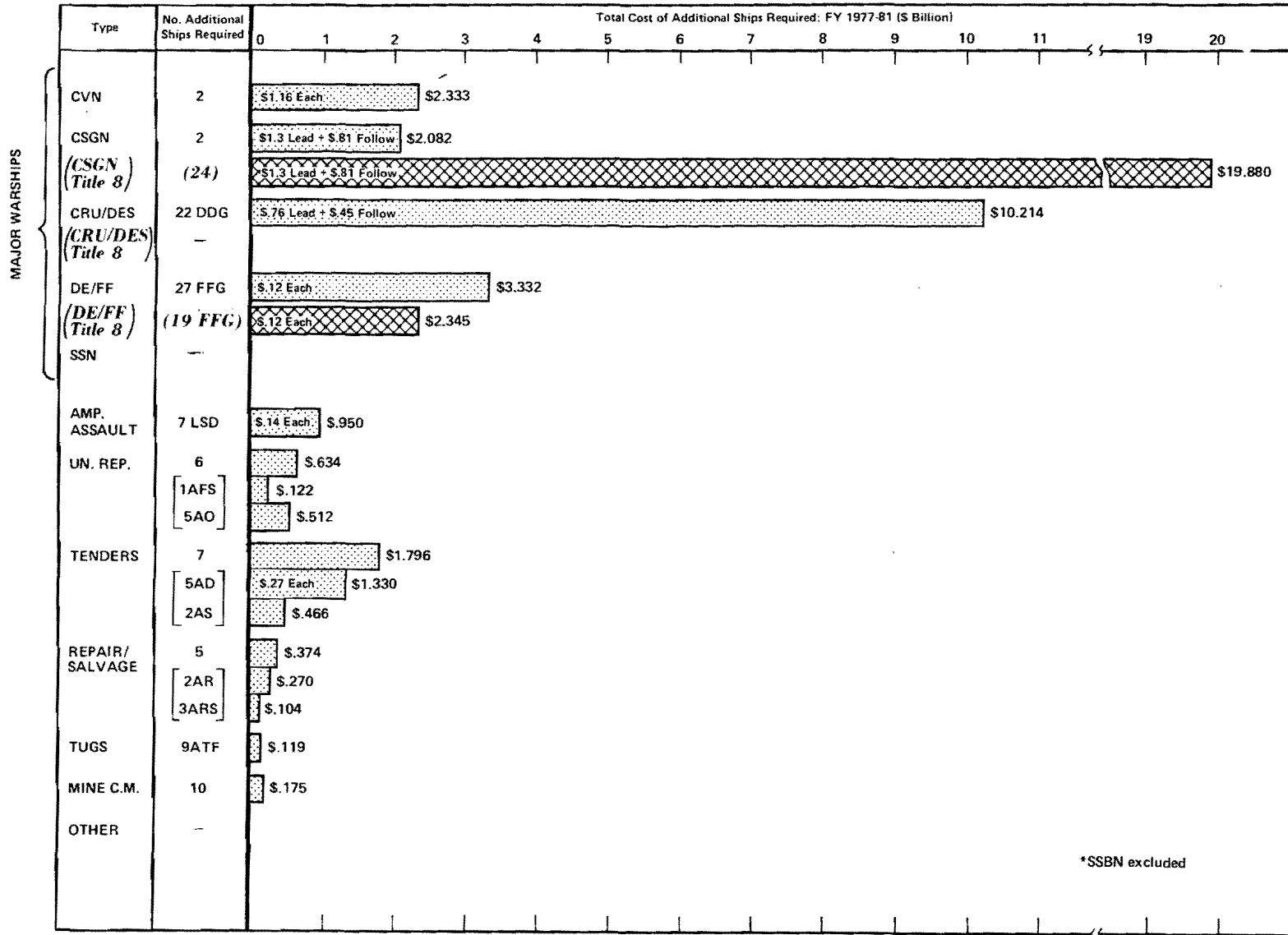
<u>Navy Force Goal</u>	<u>Average Annual Cost</u>
500 Ships (All Nuclear Major Escorts)	4.4 (5.8)
600 Ships (All Nuclear Major Escorts)	7.6 (8.6)
President's Proposal	4.5

As with the 600-ship alternative, the 500-ship shipbuilding program emphasizes construction of vessels other than warships. As Table 3 indicates, of the approximately 100 ships that need to be constructed to maintain the Navy at its present level, 44 appear in the "amphibious assault," "support," and "other" categories.

While the President's fiscal year 1977 budget calls for only 16 vessels, it does provide for advance funding for a strike cruiser as well. The budget request is consistent with a 500-ship goal for fiscal year 1986.

TABLE 3

# 500 SHIP NAVY — 5 YEAR (FY 1977-1981) PROCUREMENT PROGRAM\* COSTS IN CONSTANT 1976 DOLLARS







## CHAPTER VI

### ALTERNATIVE FORCE LEVELS: A 400-SHIP FLEET

#### Toward a 400-Ship Alternative

This option assumes that the threat as perceived by advocates of higher force levels is exaggerated in the context of present international developments. If the United States truly intends to scale down its international commitments, the Navy could adapt its posture to conform with these developments. A Navy strategy which presumes a prolonged conventional war in the Atlantic/Mediterranean region generates requirements for large forces. This presumption may be unrealistic, either regarding Soviet intentions or NATO capabilities. A possible structure for the Navy might emphasize capability to counter the lesser, though important, contingencies that might arise out of localized conflict in the Mediterranean region and elsewhere, without planning forces to give the United States high confidence of defeating the USSR in general war. Similarly, this option would argue for readjustment of U.S. presence in the Western Pacific in light of cessation of hostilities in Vietnam and Cambodia and the diminution of our interests there.

Table 1 illustrates a more modest naval force level.<sup>14</sup> The Navy would number only ten carriers, enough for two permanently on station in the Atlantic/Mediterranean sector, one on station in the West Pacific, and a surge capability to four carriers in either ocean. The overall escort level would decline. Table 4 indicates that only 18 escorts would have to be built to provide platforms for the AEGIS air defense system. Once again, full implementation of Title VIII has major cost implications for pursuit of the 400-ship program: An additional \$5.4 billion would have to be expended for the procurement of strike cruisers rather than conventionally powered AEGIS ships.

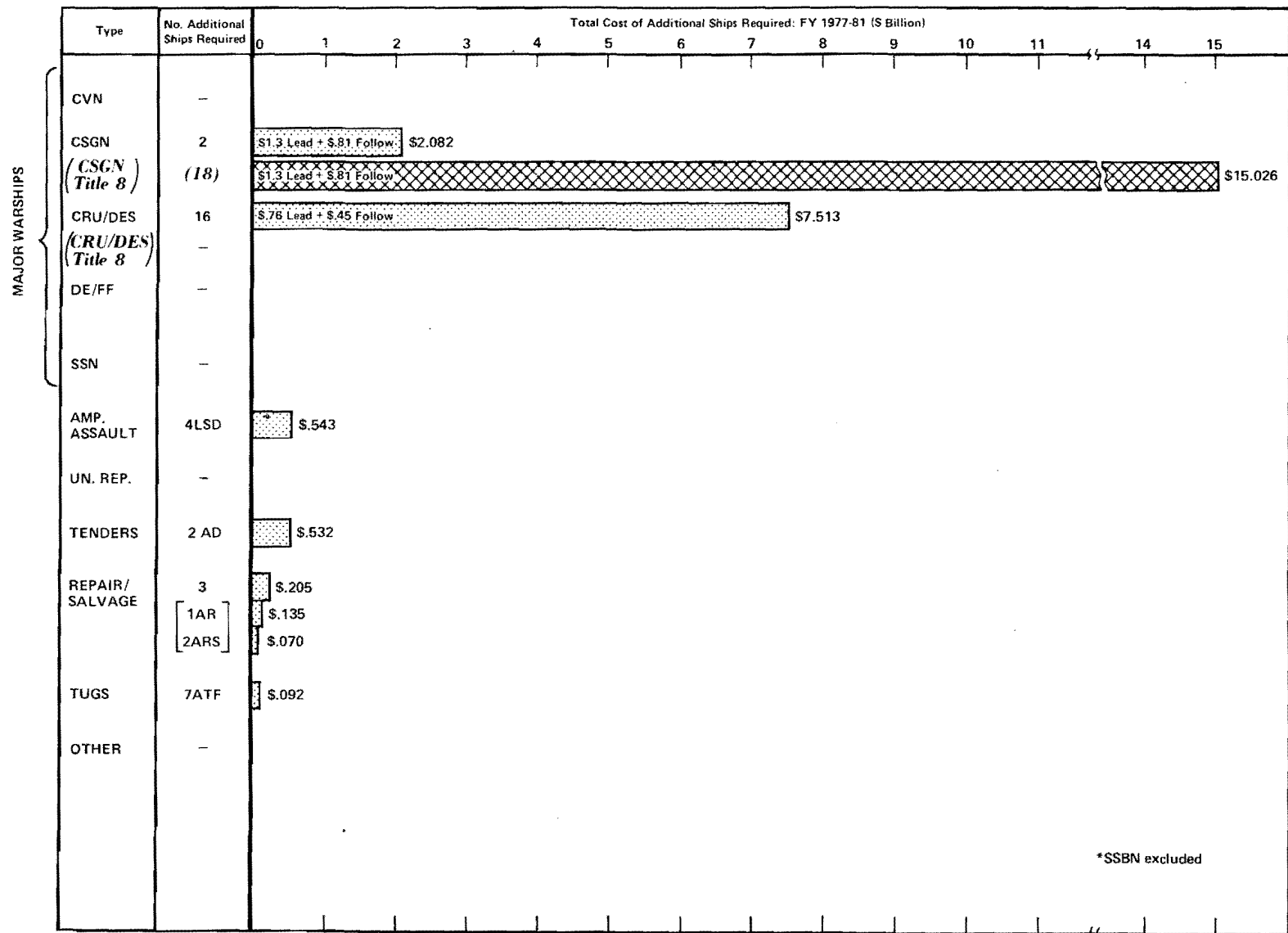
In addition to the absence of a carrier construction program, there would be no authorization for new submarines. The SSN-688 program, with a backlog of 27 funded but undelivered SSNs, would be completed, yielding a total of 82 SSNs. A smaller Marine force would be needed, and consequently, considerably fewer amphibious assault vessels as well. Support ship levels likewise would decline.

#### Effects on Shipbuilding Industry

Table 4 reveals that 34 vessels must be built under the 400-ship option over fiscal years 1977-81. The resulting annual average of 6.8 ships would help to reduce pressures on the shipbuilding industry and

TABLE 4

# **400 SHIP NAVY — 5 YEAR (FY 1977-1981) PROCUREMENT PROGRAM\*** **COSTS IN CONSTANT 1976 DOLLARS**



permit diversion of capacity to the existing large overhaul backlog (both issues are discussed in detail in the latter part of this paper). It appears that by 1978-79, when the present decline in orders for tankers is projected to be most severely felt, the effects of a reduced naval shipbuilding program would have an adverse impact on the industry. Builders might face severe stagnation, plant contraction, and even the closing of yards. Seven ships a year could hardly be expected to sustain the industry as it is presently constituted if commercial business declines as sharply as is now foreseen. Proponents of a smaller Navy could argue, however, that the late 'sixties likewise witnessed a severe contraction in the number of naval vessels authorized by Congress without collapse of U.S. shipbuilding. Furthermore, while the shipbuilding industry may presently be in the doldrums, it has not suffered from widespread shutdowns. Admittedly the tanker boom of the late 'sixties contributed to the industry's buoyancy, but a good part of the world tanker market was, in any event, dominated by foreign builders, particularly Japan. Lastly, the Jones Act, and MarAd Construction Differential Subsidies (CDS) could help to ensure that the industry will survive.<sup>15</sup>



## CHAPTER VII

### NUCLEAR-POWERED ESCORTS: COSTS AND CAPABILITIES

#### Introduction

As noted above, Title VIII affects the cost of escorts to be procured for the preceding alternative force levels. It may be useful to discuss some additional cost and capability implications of Title VIII of the Department of Defense Appropriation Authorization Act of 1975, entitled "Nuclear-Powered Navy."

Section 804 of the act states that:

All requests for authorization or appropriations from Congress for major combatant vessels ... shall be for construction of nuclear powered major combatant vessels ... unless and until the President has fully advised the Congress that construction of nuclear powered vessels...is not in the national interest.

As defined in a previous section, "major combatant vessels" refers to submarines, aircraft carriers and their escorts in task forces, and any vessels acting independently whose need for "essentially unlimited high speed endurance will be of significant military value."<sup>16</sup> Title VIII was in great part a Congressional response to the October Middle East War and ensuing oil embargo. Its unstated premise is that the Navy was highly vulnerable to an embargo of foreign fossil fuel;<sup>17</sup> it seeks to ensure that no future embargo could affect the Navy's ongoing operations. Congress has authorized only nuclear-powered submarines since 1957; few have questioned the need for the military advantages which only nuclear power can provide for submarines. The thrust of Title VIII is, therefore, directed at major surface vessels, and particularly at carrier escorts, where there has been considerable debate about the cost/benefit trade-offs of nuclear power. Evaluating these trade-offs is complicated by problems of comparing the costs and capabilities of nuclear and nonnuclear ships. Costs are difficult to compare, because fuel costs of nuclear ships are dependent on the costs of nuclear cores and periodic rechargings. On the other hand, the fuel costs of conventional ships are derived from the costs of burning and delivering conventional fossil fuels. Comparison of capabilities likewise is difficult, since nuclear-powered ships tend to be larger and differently equipped from the nonnuclear ships for which they substitute. As a result, nuclear ships are seldom, if ever, compared with nonnuclear equivalents of like size and armament.

The following discussion, particularly that which relates to costs, will focus on the major Title VIII-related decision that confronts

Congress in the President's fiscal year 1977 budget requests: the choice between procuring a mixed force of strike cruisers (CSGNs) and conventional guided missile destroyers (DDG-47s) or choosing a major escort ship program consisting exclusively of CSGNs.

### Cost Comparison of Nuclear (CSGN) and Conventional (DDG-47) Escorts

#### Procurement Costs of CSGNs and DDG-47s

Nuclear escorts cost at least 50 percent more to build than their conventional counterparts.<sup>18</sup> The follow-on strike cruiser projected in the fiscal years 1977-81 shipbuilding program will cost about 80 percent more than its conventional counterpart, the DDG-47: \$809 million (in constant 1976 dollars) versus \$450 million. Certain procurement savings are, in fact, possible if a full Title VIII program is implemented. Within the context of carrier task forces, three conventional escorts can be traded for two nuclear ones. The force levels outlined in Tables 1 and 2 above (and more specifically described in Appendix A) provide for a reduced patrol frigate (FFG) procurement if Title VIII is fully implemented.<sup>19</sup> However, the savings from procurement of eight fewer FFGs for both the 600- and 500-ship options only partly covers the CSGN/DDG cost differential. Under the 600-ship option, full Title VIII implementation would add 18 CSGNs to the procurement program in place of 18 DDG-47s. The total program cost would rise by \$4.12 billion in constant 1976 dollars. Similar Title VIII implementation for the 500-ship option would replace 22 DDG-47s with a similar number of strike cruisers and allow for a buy of eight fewer FFGs, with an overall net program cost increase of \$5.32 billion in constant 1976 dollars.

Advocates of nuclear propulsion point to long-term fuel savings achieved by use of a nuclear core which may last 10 to 13 years. They assume in their calculations that fuel prices and delivery prices will maintain a steady, if not upward trend.<sup>20</sup> These calculations include the cost of both procuring and operating the present Navy contingent of oilers as part of the "delivery costs."<sup>21</sup> Clearly, the thrust of the argument is to offset procurement costs with operational savings. However, it may be useful to include the possible savings on oiler procurement within the overall procurement cost calculation before turning to the question of possible operation savings.

#### Reduction in Oilers Problematical; Some Savings Possible

It is somewhat problematical whether a nuclear escort force would allow reduction in the number of fleet oilers. Fuel supplies for escorts are also stored in the nuclear carriers to which they are attached. It is difficult to determine just how many oilers could be "saved" by switching to nuclear propulsion. A switch from conventional to nuclear-powered escorts would in general not result in the elimination of one

oiler per escort, since oilers serve more than one ship. Even under full Title VIII implementation, the fleet of the 'nineties would include a sizable number of FFGs, as well as other conventional escorts authorized prior to fiscal year 1977. If Title VIII were fully implemented, the workload of oilers would be reduced, but not eliminated. Furthermore, the options outlined in this paper seek to achieve conventional warship-to-oiler ratios that fall near or between the present Navy ratio of 12:1 and a probable Navy ratio of 14:1 if its fiscal years 1977-81 shipbuilding program is fully realized. If one were to assume that with full Title VIII implementation four oilers could be dropped from the 600-ship force, this would create a 17:1 ratio. Similarly, if three oilers drop from the 500-ship full Title VIII option, the resulting ratio is 16:1. Nevertheless, if procurement savings from dropping four oilers and eight FFGs are deducted from the cost differential between CSGNs and DDGs, the CSGN program would cost \$3.75 million more in fiscal years 1977-81 if Title VIII were fully implemented for the 600-ship option. For the 500-ship program, if these procurement savings from dropping three oilers and eight FFGs are deducted from the cost differential between the CSGN and DDG-47 programs, the CSGN program would cost \$5 billion more in fiscal years 1977-81 under full Title VIII implementation. The comparative cost differentials, with and without the procurement of oilers, appear in Table 5.<sup>22</sup>

#### Comparative Fuel Costs: CSGN vs. DDG-47

As was noted above, proponents of Title VIII assert that savings in operating costs can be realized through extensive employment of nuclear power. Analysis of fuel costs, even with the hypothetical elimination of oilers, does not unequivocally bear out this contention. The annual cost of nuclear propulsion is measured by the annual cost of procuring and installing nuclear cores, which last 10 to 13 years. When these costs are taken into account and allowance is made for the fact that the nuclear ships average about 2-1/2 times the steaming hours of their conventional counterparts, the annual fuel cost for a CSGN is \$3.8 million (in 1976 dollars) more than for a DDG-47 class ship.

For the 600-ship, full Title VIII alternative, procurement of 18 CSGNs involves procurement of eight fewer FFGs. If the FFG fuel costs are deducted from the marginal program cost of fuel for the 18 CSGNs, the CSGN program cost exceeds that of the DDG-47 by \$55.7 million (1976 dollars) per annum, and \$1.67 billion over a 30-year life cycle. For the 500-ship option, the annual fuel cost of a 22 CSGN program, with fuel costs of eight FFGs deducted, would exceed that of an equivalent DDG-47 buy by \$70.8 million and, in life cycle terms, \$2.1 billion.

If the fuel costs of four oilers are also deducted from the 600-ship 18 CSGN-DDG-47 cost differential, the CSGN program fuel cost would

TABLE 5

PROCUREMENT PROGRAM AND UNIT COST DIFFERENTIAL: CSGN VS. DDG-47  
 600- AND 500-SHIP OPTIONS: TITLE VIII FULLY IMPLEMENTED  
 (Constant 1976 dollars, in millions)

<u>600 Ships</u>			<u>500 Ships</u>		
Cost Differential:			Cost Differential:		
18 CSGN vs. 18 DDG-47	5,104.5 <sup>a</sup>		22 CSGN vs. 22 DDG-47	6,308.1 <sup>a</sup>	
Less: 8 FFG	(987.2)		Less: 8 FFG	(987.2)	
Less: 4 A0		[(362.8)]	Less: 3 A0		[(272.1)]
Net Cost Differential	4,117.3	[(3,754.5)]	Net Cost Differential	5,320.9	[(5,048.8)]
Cost Differential Per Ship	228.7	[(208.6)]	Cost Differential Per Ship	241.9	[(229.5)]

a. Initial core procurement excluded from CSGN procurement costs.



exceed that of the DDG-47 by \$51.5 million, and in life cycle terms by \$1.55 billion. If the fuel costs of three oilers are deducted from the 500-ship 22 CSGN-DDG-47 cost differential, CSGN program fuel costs would exceed those of the DDG-47 by \$67.7 million and, in life cycle terms, by \$2.0 billion (see Table 6).

#### Other Operating Costs: CSGN vs. DDG-47

Overhaul and manpower costs also add to the cost differential. It should be noted that while CSGNs are nearly twice as large as DDG-47s, displacing 17,000-18,000 tons as compared to the 9,000-ton DDG, these ships are presently the only alternative AEGIS air-defense vessels. With fuel costs excluded from the calculation, and allowance made for operating savings as a result of procurement of eight fewer FFGs, the operating costs of an 18 CSGN program under the 600-ship option exceed those of an equivalent DDG buy by \$172 million in constant 1976 dollars. The life cycle nonfuel operating costs of an 18 CSGN program will exceed that of an 18 DDG program by \$5.2 billion (1976 dollars). The operating costs of the 22 CSGN program under the 500-ship Title VIII option, with operating costs of eight FFGs deducted, will exceed those of a 22 ship DDG-47 program by \$219 million annually and \$6.6 billion in life cycle terms (all in 1976 dollars).

One must, of course, also consider the savings that could be realized if the operating costs of three or four oilers (depending on the option followed) were eliminated. Total operating costs (nonfuel) for each new oiler are about \$9.3 million (1976 dollars). Thus, if one were to drop four oilers from the 600-ship option, the operating costs could be reduced by \$37 million annually and life cycle costs by \$1.1 billion. Similarly, if three oilers were dropped from the 500-ship option, the annual operating cost would decline by \$28 million and life cycle costs by \$836 million (see Table 7).

#### Cost Analysis Summary: CSGN vs. DDG-47

The cost of procuring only nuclear-powered CSGNs exceeds that of a mix of CSGNs and DDGs, even if it is assumed that fewer oilers need to be procured and maintained. If no oilers are dropped from the forces proposed in the 600-ship option, and the ratio of conventional ships to oilers is maintained in roughly the proportions that presently obtain, the marginal procurement cost of the Title VIII program over five to six years would be at least an additional \$4.1 billion (in 1976 dollars). The marginal life cycle fuel cost would total a further \$1.7 billion. Additionally, other operating life cycle costs for the CSGNs will exceed those for DDG-47s by \$5.2 billion. If, however, four oilers are dropped from the 600-ship Title VIII option, the CSGN procurement cost would exceed that for the DDG-47 program by \$3.8 billion, marginal life cycle fuel cost by \$1.5 billion and operating life cycle cost by \$4.1 billion (all in fiscal year 1976 dollars).

TABLE 6

FUEL COST DIFFERENTIAL: CSGN VS. DDG-47  
 600- AND 500-SHIP OPTIONS: TITLE VIII FULLY IMPLEMENTED  
 (Constant 1976 dollars, in millions)

<u>600 Ships</u>			<u>500 Ships</u>		
Fuel Cost Differential:			Fuel Cost Differential:		
18 CSGN vs. 18 DDG-47	67.8		22 CSGN vs. 22 DDG-47	82.9	∞
Less: 8 FFG	(12.1)		Less: 8 FFG	(12.1)	
Less: 4 A0		[(4.2)]	Less: 3 A0		[(3.2)]
Net Cost Differential	55.7	[(51.5)]	Net Cost Differential	70.8	[(67.7)]
Life Cycle Cost Differential	1,671.9	[(1,546.0)]	Life Cycle Cost Differential	2,124.2	[(2,030.0)]

TABLE 7

OPERATING COST (NONFUEL) DIFFERENTIAL: CSGN VS. DDG-47  
 600- AND 500-SHIP OPTIONS: TITLE VIII FULLY IMPLEMENTED  
 (Constant 1976 dollars, in millions)

<u>600 Ships</u>			<u>500 Ships</u>		
Operating (Nonfuel) Cost Differential:			Operating (Nonfuel) Cost Differential:		
18 CSGN vs. 18 DDG-47	210.2		22 CSGN vs. 22 DDG-47	256.9	8
Less: 8 FFG	(38.0)		Less: 8 FFG	38.0	
Less: 4 A0		[(37.1)]	Less: 3 A0		[(27.9)]
Net Cost Differential	172.2	[(135.1)]	Net Cost Differential	218.9	[(191.0)]
Life Cycle Cost Differential	5,166.0	[(4,051.7)]	Life Cycle Cost Differential	6,567.0	[(5,731.3)]

Similar observations apply to the effects of full Title VIII implementation upon a 500-ship alternative. The initial investment cost of 22 CSGNs will exceed that for 22 DDG-47s by \$5.3 billion, and CSGN life cycle fuel costs and other operating costs would exceed those of the DDG-47 by \$2.1 billion and \$6.6 billion, respectively, if no oilers are dropped from the projected force. Should three oilers be eliminated, the 22 CSGN-DDG program differentials would drop to \$5.0 billion for procurement, \$2.0 billion in life cycle fuel costs, and \$5.8 billion in other life cycle operating costs (all in 1976 dollars).

It should be noted that the figures for both the 600- and 500-ship programs are not "steady state" figures. A fully nuclear Navy, with all destroyers replaced by nuclear-powered vessels, cannot be achieved until the 21st century, when the DD-963 class will become obsolescent. The figures outlined above show the marginal costs of the first step toward an all nuclear Navy--the procurement of strike cruisers in place of guided missile destroyers--and indicate that these costs cannot be recovered in operations-related savings.

#### Assessing the Cost/Capability Trade-Off

The question of superior individual capability for nuclear ships must be subsumed in the problem of overall fleet capability and related to both cost and force levels. It has been argued that when crises suddenly materialize, conventionally powered ships must steam at less than top speed in order to conserve fuel on the way to trouble spots long distances away. Nuclear ships can respond and arrive on the scene more quickly, as did the Enterprise and the Bainbridge on various occasions during the Vietnam War.<sup>23</sup> Furthermore, an oil embargo imposed in a crisis would not hamper the Navy's major operations if all its major warships were nuclear.

Advocates of nuclear propulsion assert that these vessels can operate for prolonged periods in areas where logistic support is lacking. They point out that under some circumstances losses of underway replenishment ships could be twice as high when they support conventional, rather than nuclear, vessels.<sup>24</sup> Nuclear propulsion enables ships to remain longer "on the line," and to travel longer distances quickly to replenish away from higher threat areas. Fewer replenishment vessels would therefore be required since they would have shorter distances to transit.<sup>25</sup>

On the other hand, with respect to the theater of operations during an attack, warship attrition, rather than fuel or munitions resupply, may well be the important factor. Having more escorts in a carrier task force could prove to be extremely valuable, if not crucial, to the outcome of the engagement. The advent and proliferation of precision guided weapons poses a new threat to major surface ships, whatever their size or speed. Warship attrition, therefore, could be more vital than attrition of replenishment vessels. In a "sustained operations" situation,

disparities in "time on the line" between nuclear and conventional ships are likely to be quite small, and long-distance transit to replenishment vessels not as crucial.<sup>26</sup> The likelihood of their attrition would certainly increase as they approach the high-risk zone, but that risk might well be worthwhile if more ships were on station to provide an extra margin of protection for carriers or convoys.

### Shortfalls in Nuclear-Trained Personnel

Certain questions regarding expanding the nuclear-powered fleet relate only indirectly to costs or capabilities. The problem of retaining enough experienced nuclear-trained manpower, as opposed to recruits, for the nuclear-powered program is one that the Navy claims has plagued this program since its inception: Nuclear officer accession goals have never been met.<sup>27</sup> The nuclear propulsion program has expanded from one submarine in 1954 to over 106 ships 20 years later. Nevertheless, reenlistment rates in the nuclear Navy have been chronically low, and have continued to remain below the desired rate despite the inception of special reenlistment bonuses for nuclear-qualified personnel. The Navy projects that the proportion of experienced nuclear propulsion plant operators will decline to a low of 50 percent of the total nuclear-trained enlisted force in 1979, as more and more experienced personnel leave the Navy.<sup>28</sup> The Navy believes improved reenlistment rates will gradually compensate for this decline, but the projection assumes that the bonus system will continue and that it will realize its objectives. There is no indication that the bonuses will be discontinued--the current bonus law was extended in 1975. However, bonuses as presently administered may not be effective in all cases. In fiscal year 1974 there was a considerable number of post-bonus resignations (43) among nuclear-trained officers, compared to 11 in the previous fiscal year, and 28 additional officers resigned in the first seven months of fiscal year 1975.<sup>29</sup> These resignations at the end of the bonus-obligated term of service were not anticipated and cast some doubt over the optimistic projections for the 1980s. Furthermore, reenlistment among nuclear operators has not improved appreciably as a result of the bonus scheme.<sup>30</sup> Clearly, maintaining adequate experienced manning for the Navy's nuclear ships is a difficult problem which has defied solution by the measures employed to date. It is to be expected that this problem will persist into the future.

### Recapitulation: A Cost/Capability Trade-Off

On balance, the criteria for choice on nuclear-powered surface ships involve assessments of long-term fuel costs and effects of a possible local or world-wide oil embargo on the trade-off between total costs, speed/endurance and quantity, and on overall perceptions of the developing international environment. Emphasis on the difficulties an oil embargo would cause in maintaining fleet operations would make nuclear vessels that need not depend on foreign energy sources seem more

attractive. On the other hand, an oil embargo would most likely occur under conditions of international unrest, such as a U.S.-Soviet naval confrontation in the Mediterranean. In the event of a conflict, it may prove valuable to stress defense in depth, provided by having more ships. This would offset the greater individual vulnerability of each of them, which is a consequence of emerging sophisticated antiship missile technology. It is important to note that much of this technology is available to the patrol boat navies of third-world countries as well as to the larger fleets of great powers.

## CHAPTER VIII

### SHIPYARDS AND SHIPBUILDING

#### Shipyard Delivery Problems

The alternatives discussed earlier presume the shipbuilding industry can deliver ships according to agreed schedules. However, as noted at the outset of this paper, the industry has been falling far behind delivery estimates. Such lags complicate planning for a Navy of any size, especially a larger one.

A shipbuilding program should allow for regular replacement of ships that wear out, as well as procurement of additional ships and new types for fleet expansion and modernization. In a period of rapidly rising inflation, such as that which has affected the U.S. economy in the 1970s, unforeseen delays in delivery result in large, unbudgeted cost growth. If not covered by additional Congressional appropriations, these additional costs can lead to cancellations of proposed programs or reduction in the number of units produced. For example, the Annual DoD Report for fiscal year 1977 reveals that only six patrol frigates (FFGs) can be procured with funds that Congress appropriated for nine vessels in the previous fiscal year<sup>31</sup>--in fact, only three months earlier. The industry has been unable to control costs; this fact, and related delays in delivery times--samples of which appear in Table 8 and Appendix B--have complicated the Navy's efforts to maintain fleet size in an orderly fashion and to promote its growth and modernization.

#### Navy Contributions to the Industry's Difficulties

The Navy has also contributed to recent problems in the shipbuilding sector. Shipbuilding involves long-term individual projects and lead times. The Navy does not seem to have pursued consistent building programs against which builders could plan hiring, training, and modernization programs. Table 9 highlights the changes that have been made from the five-year plan presented to Congress in fiscal year 1975 to the plan presented in 1977. Congressional action can add to the uncertainties involved in long-term shipbuilding prospects. As Chart I reveals, Congressional reductions are not uniform each year. In addition Congress can add vessels to the program. Historically, these have been high cost nuclear projects.

TABLE 8

SHIPS DELIVERED AFTER APRIL 1973: AVERAGE LAGS FROM  
 APRIL 1971 ESTIMATED DELIVERY DATES  
 (As of 12/75 or most recent estimates)

<u>Ship</u>	<u>No.</u>	<u>Avg. Lag (Mos.)</u>	<u>Longest Lag (Mos.)</u>
CVN	2	22.0	24
CGN (DLGN)	5	13.2	17
DD (963 Class)	24	12.0	17
FFG (DE 1052 Class)	7	4.3	7
PF	1	3.0	3
LHA <sup>a</sup>	5	31.2	46
AOR	2	8.0	10
ASR	1	18.0	18
SSN (688 Class)	21	11.0	17
SSN (non-688)	5	9.6	14
All SSN	26	10.8	17

Source: House Committee on Appropriations, Hearings, Department of Defense Appropriations, FY 1972, FY 1973, FY 1974, FY 1975, FY 1976 (1971-75).

a. Average lag for the 5 LHAs, based on original May 1, 1969 contract estimates, is 43.8 months. Longest lag is 60 months for the 5 LHAs.



TABLE 9

COMPARISON OF FISCAL YEAR 1977 FIVE-YEAR SHIPBUILDING PROGRAM  
(GENERAL PURPOSE NAVY) WITH FISCAL YEAR 1975 FIVE-YEAR  
PROGRAM FOR OVERLAPPING FISCAL YEARS 1977, 1978, 1979  
(Fiscal year 1975 program figures in parentheses)

Type	1977	1978	1979	Total
CVNX	--	--	1( a )	1(-- )
SCS	--( 2 )	--( 2 )	--	--( 4 )
CSGN	--	1( a )	--	1(-- )
DDG-47	1( a )	--	2( a )	3(-- )
FFG(PF)	8(10 )	8(10 )	8(11 )	24(31 )
SSN	3( 3 )	2( 2 )	2( 3 )	7( 8 )
PHM	--(12 )	--	--	--(12 )
AD	1( 1 )	1( 1 )	1( 1 )	3( 3 )
AS	1( 1 )	--	--	1( 1 )
AO	1( 3 )	1( 2 )	1( 1 )	3( 6 )
ATF	--( 3 )	4( 3 )	--	4( 6 )
MCM	--	--	1(-- )	1(-- )
AGOS	--	1(-- )	2(-- )	3(-- )
Total	15(35 )	18(20 )	18(16 )	51(71 )

Sources: Ibid.; DoD Annual Report, fiscal year 1977, p. 168.

(a): In presenting the fiscal year 1975 program, Admiral Holloway indicated that within the five fiscal years 1975-79, provision was being made for carrier replacements and AEGIS platforms (Seapower Subcommittee of House Armed Services Committee, Current Status of Shipyards: 1974, 93-2, 1974, p. 1508).

## CONGRESSIONAL ADDITIONS TO NAVY PROGRAM REQUESTS

<u>Fiscal Year</u>	<u>Type</u>	<u>Propulsion</u>	<u>Appropriation (Constant '76 \$ in millions)</u>
1966	(2) SSN - 637	nuclear	269
1967	DLGN	nuclear	254 (lead ship)
1968	DLGN	nuclear	213
1971	SSN - 688	nuclear	252

Fewer Yards Engaged in New Construction

The Shipbuilders Council of America states that the Navy has "consciously" sought to limit the number of yards engaged in new construction.<sup>32</sup> The Commission on American Shipbuilding takes a similar view with respect to the Navy's choice of yards for major warship construction.<sup>33</sup> At present only three yards account for 90 percent of all Navy new construction. One of them, Newport News, is the lone builder of nuclear surface ships. Of the others, Litton and Electric Boat, the latter constructs the remainder of the nuclear-powered force. No other yard is qualified for nuclear ship construction.

The Navy also determined that savings could be realized if new construction work were limited to commercial yards and Navy yards were limited to overhauls and maintenance. New construction has not been allotted to a Navy yard since 1967, and two yards, Boston and Brooklyn, have been closed. One result of this Navy policy has been to create bottlenecks at certain key yards, particularly those with nuclear construction programs. These yards are so overloaded that a delay in one delivery often can cause a chain reaction of delays in many others.

Litton Highlights Shipbuilding Difficulties

The most conspicuous case of this chain reaction effect has occurred at the Litton yard in Pascagoula, Mississippi. In 1969 Litton accepted a contract for nine helicopter carriers (LHA); the following year it undertook to construct a series of 30 DD-963 class destroyers. A General Accounting Office (GAO) report completed in July 1973 (at which point no ship of either class had been completed) indicated that the delays in LHA delivery were likely to influence the DD-963 timetable.<sup>34</sup> As of the time of this writing, only one LHA has been delivered (18 months late); the second is 23 months overdue. Only two destroyers have been completed. As Table 8 indicates, the class as a whole is averaging a delivery lag of 12 months.

### Mitigating Factors in LHA/DD-963 Case

It must be noted that the LHA/DD-963 case was unique in several respects. Litton has built a new yard which saw its initial service in the context of the two projects. A number of adjustments were necessary before it was fully integrated with older plant facilities and operations. Management headquarters were moved from California to Mississippi after the projects had been undertaken. Both of these developments clearly affected the yard's operations, but they were of a once-only kind. Further extended delays such as that for the LHA series need not be anticipated.

Nevertheless, a few key yards are carrying a major part of the naval shipbuilding program, and delivery lags are very real and widespread. It is significant that the SSN-688 program at the Electric Boat shipyard was running an average of 11 months behind schedule before the start of a 154-day strike of 10,000 submarine workers.<sup>35</sup> The effect of this strike on the submarine deliveries will not be fully apparent for some time, but there is no doubt that it has impaired the orderly completion of the program.

### Apparent Manpower Shortages at Shipyards

The delay in completing contract vessels seems to indicate limitations on shipyard capacity. Still another indicator which ostensibly supports this conclusion is the magnitude of reported manpower shortages at the shipyards involved in naval construction. A 1974 Maritime Administration study concluded that there were "moderate to serious shortages of skilled labor in all major ship new construction areas."<sup>36</sup> Shortages in key skill areas, such as pipefitters, shipfitters, alloy welders, electricians, and machinists, added to the intensity of the general manpower problem.<sup>37</sup> Reported inadequacies in training programs further seemed to indicate that the problem is not likely to resolve itself for some time. Shipyards were sustaining high turnover rates, losing skilled workers to construction industries which paid more attractive wages.

### Fleet Readiness May Affect Shipbuilding Capabilities

Still another factor that may influence shipbuilding capacity is the material readiness of the active fleet. Commercial yards overhaul and repair naval vessels in addition to building them. Such activities may affect shipbuilding capacity, particularly as two of the three yards that presently construct 90 percent of all new ships also overhaul vessels. Because questions of fleet readiness in fact involve issues other than new construction, they will be addressed separately at the end of this section.

### Is There Enough Shipyard Capacity for a 600-Ship Program?

The issues raised here pose difficulties for the pursuit of any shipbuilding program. They are particularly acute with respect to the 600-ship option which would call for two to three times the average annual number of new ships to be built over the next 5 to 10 years as in the past decade. Accordingly, special attention should be focused on the availability of shipyard capacity for naval expansion.

### Reassessing Manpower "Shortages"

Insofar as manpower shortages are attributable to poorer pay and working conditions at shipyards, better pay would clearly serve to heighten shipbuilding's attractiveness. In addition, steadier work and the present depressed condition of competing construction industries would also help bring about a higher shipyard worker retention rate. Similarly, additional funding for expanded training programs could help to tap the labor pool that exists in high unemployment areas near major shipyards, particularly in the Northeast and on the West Coast. An independent study, commissioned by the Maritime Administration, has indicated that the very fact of high unemployment rates in areas contiguous to shipyards influences this migration. It found that turnover rates tend to decline as unemployment in surrounding areas rises: Job security takes precedence over a desire for better pay.<sup>38</sup> It is significant that the locales of seven major yards had unemployment rates of 6.5 percent or higher in 1974, compared to a national rate of 5.6 percent for that year. According to the study, these rates will probably continue to rise over the next five years.<sup>39</sup> The study focused specifically on 10 "critical" categories of skilled workers, which together account for 65 percent of total shipyard employment.<sup>40</sup> Independently of any additional financial incentives, shipyard labor shortages may well be mitigated, should general unemployment rates remain relatively high and should regional rates retain their present relations to the national average.

Still another factor affecting the availability of manpower for work on naval vessels is the degree to which labor is committed to nonnaval shipbuilding. Major shipyards undertaking naval construction in the past have tended to shy away from taking on new naval work because of the greater profitability, simplicity, and freedom from oversight involved in work on commercial vessels. Nevertheless, major yards are reporting low and near-empty commercial order books beginning in 1977. Newport News expects to reduce its work force by 4,000-5,000, from its present 23,000 level. The Industrial Union of Marine and Shipbuilding Workers reports that other yards face similar difficulties.<sup>41</sup>

Taken together, these facts lead to the conclusion that, given present unemployment rates, commercial orders, and financial inducements, the manpower shortage is not an inherently insoluble problem.

### Plant Capacity Available

As late as 1964, 14 private shipyards were engaged in the construction of 83 major combatant, amphibious, and large support vessels, in addition to construction being undertaken in five Navy yards. Of those 19 yards, 6--Litton, Electric Boat, Newport News, and the Mare Island Navy Yard, Portsmouth Navy Yard, and Puget Sound Navy Yard--constructed nuclear-powered vessels. As noted above, Navy yards no longer undertake shipbuilding and the other three yards are responsible for 90 percent of all new construction.

There is no reason why this situation should not change with respect to both categories of propulsion. On the conventional side, the Navy has stated that five yards, apart from Newport News, Litton, and Electric Boat, have the capacity to build ships up to patrol frigate (FFG) size, while five more can construct support craft.<sup>42</sup> These yards are listed in Table 10 (and shown in Map A) together with other possible sites for conventional ship construction. Most of them undertook substantial modernization programs in the late 'sixties and early 'seventies. For example, the Bath yard reconstructed two shipways to handle the construction of vessels up to 700 feet by 130 feet (a DD-963 is 530' x 54'). The Sparrows Point yard has added a large building basin for ships up to 1200' x 192' as well as appropriate cranes and transporters for construction of larger vessels. The Quincy yard is constructing two building ways to handle ships up to 1000' x 44'. Sun Shipbuilding's recently completed program gives the yard a capability to construct either one vessel 1600' x 200' or two smaller 800-foot vessels simultaneously. Similar or lesser improvements have been undertaken at other yards.<sup>43</sup>

### Nuclear Ship Construction Possible at Quincy

The General Dynamics yard at Quincy was responsible for the construction of the nuclear-powered cruiser Long Beach and the frigate Bainbridge while still under the ownership of Bethlehem Steel. It has since lost its nuclear-qualified status. However, Navy spokesmen<sup>44</sup> and a recent Navy/MarAd/OMB study<sup>45</sup> have stated that the Quincy yard could be requalified. It could then provide some relief for the hard-pressed Newport News and Electric Boat yards. Newport News presently constructs all the nuclear surface vessels in the Navy program, plus some nuclear submarines. Electric Boat builds the bulk of nuclear-powered submarines.

### Navy Yard Shipbuilding Could Ease Pressure on Commercial Yards

Table 10 indicates that additional nuclear construction capability is available at Navy yards. Navy yards could also undertake the construction of conventional vessels.

TABLE 10  
POTENTIAL BUILDERS OF SHIPS FISCAL YEARS 1977-81 PROGRAMS

X = Navy List      (X) = (Unofficial) Shipbuilders Council List      P = Constructed Vessel in Past Programs

YARD	Warships					Other Ships							
	CVN	CSGN	DDG	FF	SSN	LSD	AE	AFS	AO AOE	AD	AS	AR	ATF
Avondale			(X)	X					X				
Bath			(X)	X					X				
Bethlehem - Sparrows Point							P		X				
Defoe			(X)	X									
General Dynamics - Quincy		X				P	P		X		P		
General Dynamics - Electric Boat					X								
Litton - Ingalls			P	X	P	P	P		X	X	P	P	
Lockheed				X					X	X			
National Steel								P	X	X			
Newport News	X	X			X								
Sun									X				
Todd - L.A.			(X)							X		P	
Todd - Seattle				X									X
Mare Island				X	X								
Philadelphia			P		(X)								
Portsmouth					X								
Puget Sound		X			P				P	P	P		

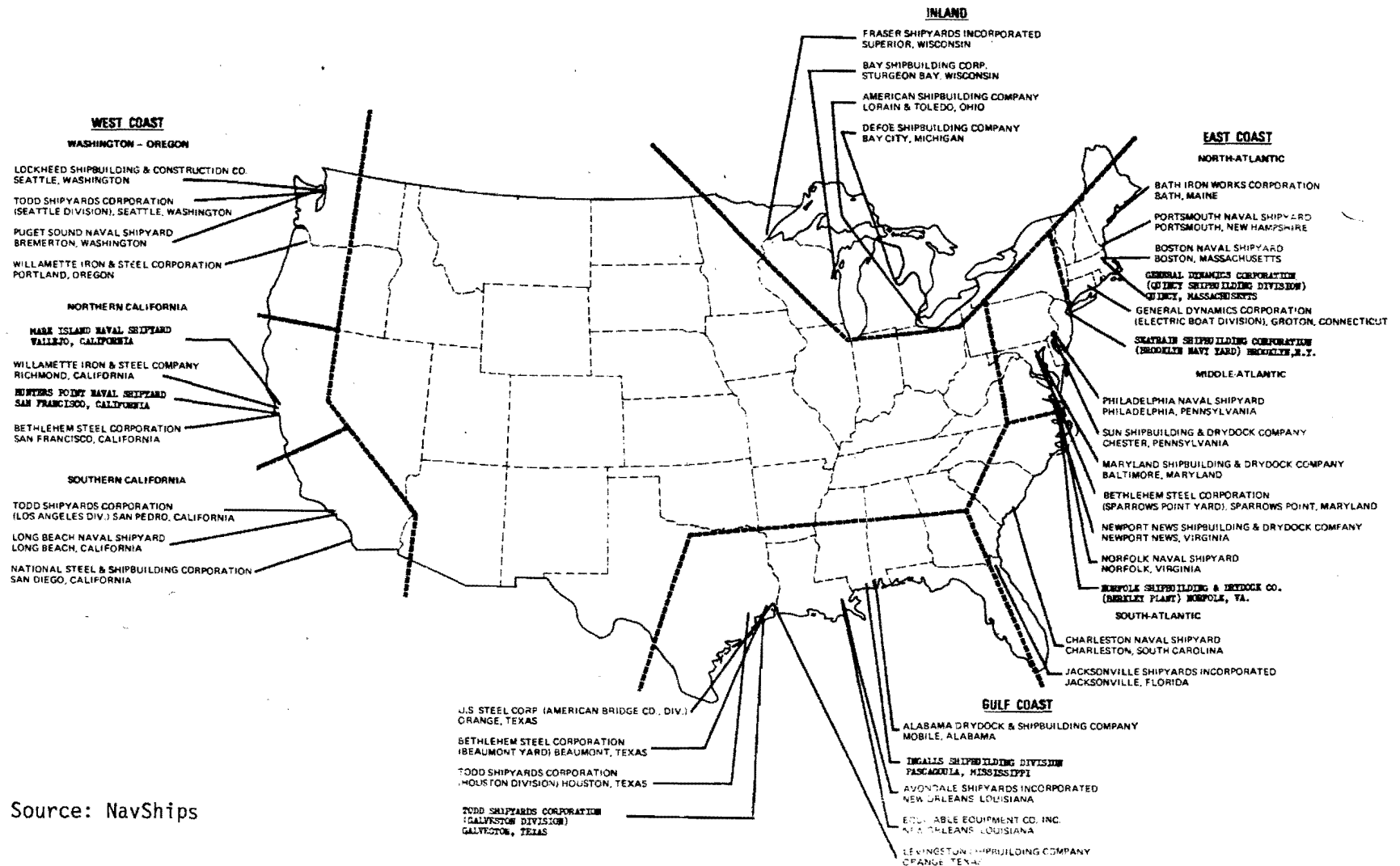
Sources: Navy: Department of Defense Subcommittee, House Committee on Appropriations, Hearings on Department of Defense Appropriations for 1976, 94-1, 1975, p. 944.

Shipbuilders Council: Interviews with officials of Shipbuilders Council of America, November 1975.

Past Programs: Jane's Fighting Ships, 1975-76.

MAP A

# MAJOR NEW CONSTRUCTION AND CONVERSION SHIPYARDS



Source: NavShips

The decision to end Navy yard construction programs was based on cost-saving grounds. Two studies completed in 1962 and 1972 compared shipbuilding costs in commercial and Navy yards and respectively found them to average 35.7 percent and 40 percent higher in the latter.<sup>46</sup> The Navy also reasoned that the resources of Navy yards were best utilized for complex overhauls and emergency repair. However, certain Navy yard plant facilities for new construction have remained intact,<sup>47</sup> and Navy spokesmen have indicated that nuclear construction can be undertaken at Mare Island, Portsmouth, and Puget Sound Navy Yards.<sup>48</sup> Philadelphia Navy Yard also has a shipbuilding capability.<sup>49</sup> Given the need for additional shipbuilding capacity and the rising costs of commercial shipbuilding, a reevaluation of Navy yards as a potential source of additional shipbuilding capacity is desirable.

#### Material Shortages Not a Constraining Factor

Relaxed cost constraints should reduce the problem of material shortages as a constraint upon shipbuilders' ability to meet greater naval requirements. Naval demand for shipbuilding related materials must receive priority attention under the 1950 Defense Production Act (P.L. 81-774). Thus, even if steel industry surplus capacity is low, Navy shipbuilding programs need not be affected if the government invokes the provisions of the act. Additionally, as the MarAd/Navy study has noted, Navy allowance for appropriate ordering lead times--which can be made in a coherent long-term program--would enhance the prospects of timely material availability.<sup>50</sup> Price, however, is another matter. Steel prices and those of other critical materials in short supply could be expected to rise in the face of greater demand, as they did in 1973-75.<sup>51</sup>

#### Recapitulation: Capacity Available

Manpower, plant, and materials capacity are presently available for fleet expansion, should that expansion be desired. The price of that expansion will be high, particularly if Title VIII is fully implemented. Whatever alternative is adopted, however, prospects for orderly achievement would be improved by changes in the way the shipbuilding planning and programming is managed. These changes affect both the shipbuilding industry and the Navy.



CHAPTER IX  
THE OVERHAUL BACKLOG

Coping with the Overhaul Backlog

As noted at the outset of this paper, the Navy is confronted by a growing overhaul backlog which has not been reduced with the passage of time. The backlog stood at 62 ships for 1975, having nearly tripled from 21 ships in fiscal year 1972 and increased by over 67 percent from fiscal year 1974.

OVERHAUL BACKLOG, FISCAL YEARS 1972-1976

Fiscal Year	1972	1973	1974	1975	1976 (est.)
Number of Ships Deferred	21	33	37	62	63

The operations and maintenance (O&M) portion of the defense budget has always suffered at the expense of Congressional reductions, Navy accounting, and inflation. The Navy has asked for more funds for overhauls and depot maintenance: \$1.8 billion for fiscal year 1977, up from \$1.4 billion (in 1977 dollars) for fiscal year 1976. The Navy also has requested more relaxed restrictions on naval shipyard manpower levels. It contends that fluctuating workloads cannot be met without flexibility in hiring practices and that otherwise these fluctuations will affect the Navy's ability to cope with its maintenance needs.

If the Navy yards are again to undertake new construction, their manpower limits would have to be relaxed. However, it is worth asking whether the present overhaul and repair process is not in need of reassessment and change.

There are indications that there is room for significant change in the present system. Despite figures which show a reduction in the amount of overhaul delay calculated in man-days (i.e., the number of days an overhaul was delayed multiplied by the number of men on the job) between fiscal years 1972 and 1973,<sup>52</sup> the growing backlog since 1973 may indicate increased delays in the completion of overhaul work. In addition it is noteworthy that in fiscal year 1974 alone, all ships with planned restricted availabilities<sup>53</sup> had that form of maintenance scheduled within six months of their most recent overhaul.<sup>54</sup> Even if one allows for the growing complexity of warships, and the lengthier

times involved in their repair, these figures would seem to indicate that the present overhaul system is not as effective as it might be.

### Increasing Overhauls Assigned to Private Yards

Expanding the number of private yard overhauls, which presently account for about 30 percent of all overhauls, may help alleviate the backlog. The Navy states that despite apparent plant capacity for private commercial overhauls in 21 yards, only seven have sufficient manpower necessary for repair work. And all also undertake repair work for foreign and American flag merchant ships, as well as new construction, both naval and commercial.<sup>55</sup> Therefore, the argument runs, too much cannot be expected from the private yards in terms of accepting additional naval repair work. However, as noted above, the Navy has also stated that shipyard capacity exists for the expansion of naval construction, and of MarAd sponsored construction as well. The most recent Navy sponsored studies on the subject indicate that private yards could expand both overhaul work and construction. These apparently conflicting accounts from the Navy itself as to the effects of shipbuilding on overhauls demand reconciliation, in order to establish whether there is excess capacity for private yard overhauls.

### Need to Stress Intermediate Level Maintenance

A leading Navy spokesman has contended that "the performance of organizational maintenance by the ship's crews on many ships is not up to standard."<sup>56</sup> Improving intermediate maintenance could help the situation.

Such improvement is desirable but difficult due to the technical complexity of modern shipboard systems. To be sure, the Navy has taken some steps in this direction. The creation in 1972 of Fleet Maintenance Assistance Groups (FMAG), which provide sailor-manned, on-shore equivalents to tender and repair ship functions, was intended to supplement the work in the latter categories. However, a second Navy spokesman stated at hearings on the 1976 budget request for the FMAGs that the implementation of the program had not yet contributed to improving the material condition of the fleet.<sup>57</sup>

The Navy is presently funding a reevaluation of its maintenance program, entitled Project Red "E." This project also seeks to provide a more effective fleet maintenance strategy.<sup>58</sup> Part of the program calls for establishment of a tender capability for electronic repair, which presently is limited. Clearly, tender maintenance, if enhanced, would ease the burden on shipyards and release greater capacity for overhauls. At the same time it would supplement on-ship repair capability. However, the intermediate level maintenance (which includes tender maintenance) workload is presently far in excess of Navy capacity to meet it.<sup>59</sup>

Realization of the Red "E" tender program is therefore likely to require additional tender procurement above presently proposed overall fleet expansion.

The Navy also has embarked on another course for improving the maintenance backlog. It has initiated the Destroyer Engineering Overhaul Cycle (DDEOC) to reschedule overhauls for DE-1052 type vessels. Under this program, ships will operate on a 54-month cycle, instead of the present cycle of 37 months. Essential to the success of the program, according to the Navy, is an initial overhaul before the recycling begins, and the need to maintain regularly all major equipment and have spare parts available for timely replacement. If these conditions are maintained, the program is envisaged to result in longer operating time for each ship and for a reduction in the overhaul backlog. Clearly, efforts such as Red "E" should aim at expanding such programs as DDEOC to other ships wherever possible--as indeed analagous cycling extensions have been programmed for nuclear-powered submarines--so as to obtain the greater possible benefits in terms of more active service and fewer scheduled overhauls.

#### Intensive Reexamination of Overhaul and Maintenance Efforts Is Required

Problems of overhaul and maintenance are crucial to fleet readiness, which itself is an important factor in planned shipbuilding programs. Additionally, overhaul and maintenance backlogs may affect shipyard capacity, and therefore shipbuilding rates. The problems outlined above and the solutions proposed for them clearly deserve further intensive examination.



## CHAPTER X

### OVERVIEW OF THE PRESIDENT'S FISCAL YEAR 1977 SCN BUDGET REQUEST

The President's budget, which calls for funds for the construction of 16 new vessels, is more compatible with a 500- than a 600-ship option. It certainly does not indicate a desire to reduce the fleet to 400 vessels. Should a 16-ship building level be maintained over the next four fiscal years, the fleet of 1986 is likely to number about 500 vessels. However, the DoD five-year shipbuilding plan actually calls for an average annual shipbuilding program of 22 ships over the next five fiscal years. If that program is fully realized, the Navy force level would rise to about 525 ships. The submarine force would reach 93 vessels by 1986, nearly the 95 projected under the 600-ship alternative.

The President's budget and five-year projections exceed the procurement cost levels of the 500-ship, partial Title VIII option outlined in this paper, but it falls considerably short of the full Title VIII option 500-ship or the partial Title VIII option for 600 ships.

#### SHIPBUILDING COSTS FOR ALTERNATIVE FLEET SIZES AND PRESIDENT'S PROPOSAL (Billions of 1976 dollars, fiscal years 1977-81)

<u>Navy Force Goal</u>	<u>Average Annual Cost</u>
500 Ships (All Nuclear Major Escorts)	4.4 (5.8)
400 Ships (All Nuclear Major Escorts)	2.2 (3.2)
600 Ships (All Nuclear Major Escorts)	7.6 (8.6)
President's Proposal	4.5

The President's request contains no advanced funding for a carrier. The five-year plan projects only two carriers (CVNX), the first of which is to be funded in fiscal year 1979. The active life of some Forrestal-class carriers will have to be extended past 30 years if the Navy is to maintain its stated force goal of 13 carriers until the CVNXs enter the fleet.

The fiscal year 1977 budget request does include advanced funding for a strike cruiser, at levels above last year's funding request, which Congress rejected. The five-year program projects only two strike cruisers and eight DDG-47s, indicating that the Navy's goal of 20 to 30 AEGIS platforms will not be met until the 1990s.

The President's budget does not, therefore, clearly point to any particular force alternative. Another year may go by without a clear signal as to the direction in which this Navy wishes to move. Title VIII is only obliquely questioned; the overhaul backlog will remain. No clear guidance is being given to the shipbuilding industry, part of whose problems stem from an inability to ascertain the Navy's long-term intentions. Until such guidance is forthcoming, delays and rising unit costs are likely to persist, to the detriment of naval force levels and capabilities.

## CONCLUSION

The decisions that Congress makes on the shipbuilding programs over the next few years will determine the size of the Navy of the 1980s and 1990s. It can choose to expand the Navy to about 600 ships; maintain the fleet at 500 ships, approximately its present level; or permit a further decline toward 400 ships by the end of the 1980s. A number of considerations will affect this choice. Among them are views of Soviet naval developments and definitions of the Navy's mission in the context of America's foreign policy goals. An additional factor will be the degree to which Congress is willing to spend more on nuclear ships, which cost more for procurement and operation than do conventionally powered ships. Lastly, Congress and the executive branch -- jointly have the task of determining Navy shipbuilding programs which will improve the responsiveness of the shipbuilding industry to the demands of naval construction, so that ships can be delivered on time and at projected prices.

## FOOTNOTES

1. Testimony of Vice Admiral Frank Price before Seapower Subcommittee of House Armed Services Committee in Hearings on Military Posture and H.R. 3689 (H.R. 6674) Department of Defense Authorization for Appropriations for Fiscal Year 1976, 94-1, 1975, Part 3, p. 3047.
2. Melvin R. Laird, Fiscal Year 1971: Defense Program and Budget: Statement Before the House Subcommittee on Department of Defense Appropriations (February 25, 1970), pp. 53-56.
3. James R. Schlesinger, Report to the Congress on the Fiscal Year 1975 Defense Budget and the Fiscal Years 1975-79 Defense Program (March 4, 1974), p. 85.
4. Probably the most thorough description of the mix and configuration of Allied fleets, indeed of all fleets, is to be found in Jane's Fighting Ships, published annually.
5. Reply of Admiral James L. Holloway, III, to written question of Chairman McClellan in Senate Committee on Appropriations, Hearings: Department of Defense Appropriations, Fiscal Year 1976, 94-1, 1975, Part 3, p. 197.
6. See, for example, Richard D. Lawrence and Jeffrey Record, U.S. Force Structure in NATO: An Alternative (Washington, D.C.: The Brookings Institution, 1974), pp. 4-22, 89-91.
7. Edward N. Luttwak, The Political Uses of Sea Power (Baltimore: Johns Hopkins, 1974) and James Cable, Gunboat Diplomacy: Political Applications of Limited Naval Force (New York: Praeger, 1971) are prime examples of a growing literature.
8. See the statement of Admiral James L. Holloway III before the House Committee on Armed Services, Hearings on Military Posture and H.R. 3689 (H.R. 6674), p. 701.
9. For a more detailed breakdown and analysis of the force mix for this option, see Appendix A below.
10. The issues concerning nuclear and conventional power for major surface vessels are discussed below, pp. 33-42.
11. Assuming an infusion of funds, and improved management and worker productivity, the lead time might be reduced by the 12 to 18 months contractors generally fall behind delivery time at present. However, tremendous advances would have to be made in order to reduce average lead times on ever more complex vessels, many of them nuclear, to less than five years from Congressional authorization. This paper assumes



that average lead times of five years will be achieved, but not bettered. Further discussion of delivery delays appears below, pp.43-47 and Appendix B.

12. For a more detailed breakdown and analysis of the force mix for this option, see Appendix A below.

13. Further discussion of the implications of Title VIII appears below, pp. 33-42.

14. A more detailed breakdown and justification of the force mix for this option appears in Appendix A below.

15. The Jones Act is the common name for the Merchant Marine Act, 1920 (41 Stat. 988). Section 27 of the act requires that, with minor exceptions, all waterborne merchandise between points in the United States be carried on U.S.-built and registered ships. Construction differential subsidies are granted by the Department of Commerce to compensate for the difference between the U.S. shipyard price for constructing, reconstructing, and reconditioning ships and a representative foreign yard price. The 1970 Merchant Marine Act (P.L. 91-469) set the maximum subsidy after 1976 at 35 percent.

16. Department of Defense Appropriation Authorization Act, 1975 (P.L. 93-365), Title VIII, Section 802.

17. House Committee on Armed Services, Report together with Additional and Dissenting Views (To Accompany H.R. 14592), No. 93-1035, 93-2, 1975, pp. 7-8.

18. Testimony of Admiral Hyman Rickover before the Subcommittee on Legislation, Joint Committee on Atomic Energy, Hearing on Naval Nuclear Propulsion Program, 94-1, 1975, p. 17. See also Subcommittee on Military Applications, Joint Committee on Atomic Energy, Hearing and Subsequent Inquiry on Nuclear Propulsion for Naval Warships, 92, 1-2, 1971-1972, pp. 131-132.

19. See above, pp.21-25, and Appendix A below.

20. Naval Ship Systems Command, "Study Comparing Fueling Costs for Nuclear and Conventional Aircraft Carriers and Frigates," in Joint Committee on Atomic Energy, Hearing on Naval Nuclear Propulsion Program, 93-2, 1974, p. 43.

21. Ibid., p. 42.

22. The lowest option, that of "400" ships, provides for no FFG procurement, hence no possible savings from a reduction in FFG purchases. Similarly, no additional oilers are called for, so that no hypothetical reductions can be made. Should Title VIII be fully implemented, the cost differential in the CSGN/DDG-47 trade-off would be \$4.5 billion (in 1976 dollars), with initial core procurement excluded from CSGN procurement costs.

23. See Subcommittee on Military Applications, Hearing and Inquiry, pp. 161-162; see also Joint Committee on Atomic Energy, Hearing - 1974, pp. 44-45 for accounts of more recent cases of rapid redeployment by nuclear-powered vessels.
24. Vice Admiral H. G. Rickover, "Memorandum for the Secretary of the Navy: Nuclear Powered Escorts" (February 3, 1967) in Joint Committee on Atomic Energy, Hearings on Naval Nuclear Propulsion Program, 90-1, 2, 1967, 1968, p. 386.
25. Ibid., pp. 382-86, passim; see also pp. 413-15.
26. See Paul H. Nitze (Secretary of the Navy), "Memorandum for the Chief of Naval Operations: Nuclear Powered Major Fleet Escorts for Nuclear Aircraft Carriers" (March 1, 1967), in ibid., pp. 435-36. See also Vice Admiral Rickover, "Comments on the Memorandum for the Chief of Naval Operations from Secretary of the Navy dated March 1, 1967 Concerning Nuclear Powered Major Fleet Escorts for Nuclear Aircraft Carriers" in ibid., pp. 442-54.
27. Reply to written question from Senator Culver in Senate Armed Services Committee, Hearing on S.920 (Authorization for Military Procurement, Research and Development and Active Duty, Selected Reserve and Civilian Personnel Strengths), 94-1, 1975, Part 3, p. 1372.
28. Reply to written question from Senator Scott, ibid., p. 1369.
29. Testimony of Admiral Hyman Rickover before the Seapower Subcommittee, Hearings on Military Posture, and H.R. 3689 (H.R. 6674), 94-1, 1975, Part 3, p. 3718.
30. Ibid.
31. Donald H. Rumsfeld, Report to the Congress on the FY 1977 Budget and Its Implications for the FY 1978 Authorization Request and the FY 1977-1981 Defense Programs (January 27, 1976), p. 167.
32. See the Shipbuilders Council of America's Ad Hoc Committee on Naval Shipbuilding Procurement Procedures report entitled A Discussion of Navy-Shipbuilding Industry Business Relationships (October, 1974), p. 5.
33. Commission on American Shipbuilding, Report - Volume II (Washington, D.C.: 1973), p. 38.
34. Comptroller General of the United States, Report to the Congress: Outlook for Production on the Navy's LHA and DD-963 Shipbuilding Programs: Department of the Navy (Washington, D.C.: General Accounting Office, 1973), p. 14.
35. A report on the end of the strike appeared in the New York Times, December 2, 1975, p. 1.

36. Cited in attachment to letter of Admiral Isaac C. Kidd to Hon. Charles E. Bennett, Chairman, dated April 2, 1974, in Current Status of Shipyards, 1974, Report by the Seapower Subcommittee of the House Armed Services Committee, 93-2, 1974, p. 40.

37. Letter from Rear Admiral R. C. Gooding to the Secretary of Defense, January 23, 1975, in Hearings on Current Status of Shipyards, 1974, Part 1, p. 20.

38. Mark Battle Associates, Preliminary Assessment of Manpower Availability, U.S. Ship Construction Industry: 1975-1980, (May 9, 1975), p. 21.

39. The seven yards are: Bath Iron Works, Sun Shipbuilding, National Steel Shipbuilding, Todd/Seattle, Todd/San Pedro, Alabama, and Avondale. Mobile, Alabama, and New London, Connecticut, near the Alabama and General Dynamics/Electric Boat Yards, had 4.4 percent and 4.7 percent rates in 1974 and were projected to rise to 6.8 percent and 7.1 percent in 1976 (see ibid., pp. 16-17 and Table 2).

40. Ibid., pp. 2-3.

41. A recent GAO report, Government Support of the Shipbuilding Industrial Base (Washington, D.C.: February 1975) has pointed to potentially conflicting demands made upon the shipbuilding industry by the Navy program and the Maritime Administration's construction differential subsidy (CDS) program (pp. 29, 38, and Appendix IV: Letter from Arthur I. Mendolia, Assistant Secretary of Defense for Installations and Logistics, to R. N. Gutmann, Director, Procurement and Systems Acquisition Division, GAO, dated September 11, 1974). It is worth noting, however, that a Navy/MarAd/OMB study entitled Coordinated 5-Year Navy/MarAd/Private Shipbuilding Program (July, 1975), which was based on the Mark Battle Associates model, projected that the Navy could undertake a substantially expanded shipbuilding program and that MarAd could increase its levels of subsidies by 20 percent without undue strain on shipyard capacity. Clearly, were the CDS level held stable, or even lower in light of the present decline in commercial demand for new ships, the pressure on shipyards would be further decreased.

42. They are Bath Iron Works; Avondale Shipyards, Inc.; Lockheed Shipbuilding; Todd/Seattle; Defoe Shipbuilding--all with capability for PF (FFG) construction; General Dynamics/Quincy; Bethlehem Steel/Sparrows Point; National Steel and Shipbuilding; Todd/Los Angeles; Sun Shipbuilding and Dry Dock.

A Shipbuilders Council of America spokesman listed the following additional yards as having the plant capacity for nonnuclear surface ship construction: up to DD tonnage--Avondale, Defoe, Bath, Todd/L.A.; up to FFG level--Todd/Seattle. The spokesman noted that National Steel has the capacity for support ship construction. Unlike the others, it has never built warships and has no experience in weapons system integration.

42. (continued)

The Navy/MarAd/OMB and Mark Battle Associates studies analyzed 13 yards for "major" construction: Bath, GD/Quincy, GD/Electric Boat, Sun Shipbuilding, Bethlehem/Sparrows Point, Newport News, Avondale, Alabama, Ingalls, Todd/L.A., Todd/Seattle, National Steel, Lockheed.

43. A description of improvements at the yards noted above, as well as additional information on shipyard modernization appears in Naval Sea Systems Command, Annual Report on the Status of the Shipbuilding and Ship Repair Industry of the United States, 1974, pp. I-26 to I-29.

44. Testimony of Rear Admiral A. J. Whittle, Jr., at Hearings Before the Task Force on National Security Programs of the House Committee on the Budget, 94-1, 1975, Part I, p. 117.

45. Navy/MarAd/OMB, Coordinated 5-Year Shipbuilding Program, Executive Summary, p. 4.

46. The earlier study was conducted by Arthur Anderson and Co. in November 1962. Booz-Allen Applied Research, Inc. presented their findings in June 1972. Synopsis and discussion of both studies appears in Current Status of Shipyards, 1974, pp. 189, 645-6, 1499-1500.

47. There are partly or fully unused facilities at Philadelphia, Mare Island, and Puget Sound Navy Yards: Testimony of Captain H. N. Ginn, Jr., ibid., pp. 273, 297, 476-81, 506-509.

48. Mare Island: Naval Sea Systems Command, Annual Report, 1974, pp. I-31, I-32. Portsmouth: Testimony of Rear Admiral R. W. Burk, Hearings on Current Status of Shipyards, 1974, p. 250. Puget Sound: Testimony of Rear Admiral S.S. Fine at Hearings Before the Task Force on National Security Programs, p. 115; Naval Sea Systems Command, op.cit., p. I-32. A Shipbuilders Council of America spokesman also cited Philadelphia Navy Yard as having a capability for nuclear ship construction.

49. Naval Sea Systems Command, op. cit., p. I-30.

50. Navy/MarAd/OMB, Coordinated 5-Year Program, p. 25.

51. John C. Kane, "Materials Shortage," Proceedings of the Department of Defense Materials Shortages Workshop, January 14-15, 1975, Arlington, Virginia (Metals and Ceramics Information Center 1975), pp. 8-12, 15-17, 20-24, 38. See also Naval Sea Systems Command, Annual Report, 1974, p. 2-19.

52. Information provided by Admiral Gooding to Department of Defense Subcommittee of House Committee on Appropriations in Hearings on Department of Defense Appropriations for 1976, 94-1, 1975, pp. 1034-35.

53. "Restricted Availability" is a technical term for depot maintenance of narrower scope than that of overhaul. When such maintenance is cycled between overhauls, it is termed "planned restricted availability."

54. Information provided by Admiral Bryan, ibid., p. 991.

55. Remarks by Admiral Gooding, ibid., p. 1010.

56. Testimony of Admiral Gaddis before the Seapower Subcommittee of the House Armed Services Committee in Hearings on Military Posture - FY 1976, p. 3555.

57. Testimony of Admiral Bagley before the Senate Armed Services Committee in Hearings on S.920, p. 1328. Admiral Bagley contended that limitations on manpower affected the program's ability to improve the fleet's material readiness.

58. See Senate Committee on Appropriations, Hearings on Department of Defense Appropriations, Fiscal Year 1976, 94-1, 1975, Part 3, pp. 1040-41.

59. Ibid., p. 1037.



## APPENDIX A

### Constructing Alternate Forces

Calculations for the force mix of each of the three alternatives were derived from recent posture statements by successive Secretaries of Defense and from Navy announcements of new programs. The methodology for these calculations is a variant of that which Arnold Kuzmack employed in his 1971 study of naval force levels.<sup>1</sup> This appendix will first outline the methodology for constructing force levels and will then delineate the calculations for each alternative.

#### A. Carrier Requirements

Current Navy planning provides three carriers for every carrier that is to be continuously deployed overseas as part of a task force. In addition to that carrier itself and its replacement in transit, a third carrier is assumed to be undergoing some form of depot level maintenance, i.e., restricted availability or overhaul. Where the projected carrier force is not a multiple of three, the remaining carriers are included to provide an enhanced surge capability during crisis situations.

Overseas homeporting arrangements may also provide additional surge capability, since the three-for-one calculation need not be applied as rigorously (less transit time is involved). The Navy presently homeports only one carrier overseas--in Yokusaka, Japan--but has maintained its three-for-one system all the same. Since no other homeporting arrangements are being projected at this time, homeporting has not been included as a factor in carrier force level calculations.

#### B. Escort Requirements

Escorts are required for carrier task forces, underway replenishment groups, amphibious assault groups, and supply ship convoys. With respect to carrier escorts, there seems to have been no change in force requirements since Secretary McNamara indicated in his fiscal year 1969 Posture Statement that a nuclear-powered carrier would require four nuclear-powered anti-air and antisubmarine warfare (AAW/ASW) escorts or, if conventionally powered escorts were used, three AAW/ASW and three more anti-air (AAW) escorts.<sup>2</sup> The latter mix would also apply to conventional escorts for conventional carriers. Four nuclear escorts are only grouped together as part of a task force if accompanying a nuclear-powered carrier. Although nuclear-powered escorts could conceivably accompany conventional carriers, no official requirement has

been stated for nuclear escorts for this purpose. Where nuclear escorts are not grouped in fours as parts of nuclear carrier task forces, they are available for "independent" or amphibious assault escort roles. The impact of Title VIII, whether partly or fully implemented, varies with differing force level alternatives, as will be illustrated below.

In assessing carrier escort force levels, it is assumed that both carriers and their escorts will require overhauls and depot maintenance at the same time intervals.

Amphibious Assault Escorts. Escort figures for amphibious assault vessels are derived from Kuzmack, who in turn based his assumptions on a 1963 press report.<sup>3</sup> He assumed that 56 escorts were required, with 8 to serve as a 15 percent overhaul allowance. The Kuzmack estimate provides for a larger number of amphibious vessels (85) than appears in any of the alternatives outlined in this paper. However, it should be noted that the implication of his argument is that a decline in the number of amphibious vessels does not necessarily imply a decline in the escort requirement for them.<sup>4</sup>

Underway Replenishment Escorts. With respect to underway replenishment escorts, the Kuzmack formula is to allow for a minimum of three escorts for each underway replenishment group (URG), which he assumes to consist of three to four vessels.<sup>5</sup> In his fiscal year 1975 Posture Statement Secretary Schlesinger spoke of "about ten" underway replenishment groups and a projected total of about 60 support and replenishment ships for the mid-1980s.<sup>6</sup> Thus it appears that an URG is now expected to consist of nearly twice as many ships as Kuzmack projected; accordingly, twice as many escorts were allowed for. As with carriers, it is assumed that protected vessels and escorts would require overhaul and depot maintenance at about the same rates.

Convoy Escorts. Finally, the fiscal year 1975 Posture Statement indicated that escorts are also required for five merchant ship convoys.<sup>7</sup> The fiscal year 1977 Posture Statement has raised that figure to fifteen.<sup>8</sup> There is no specific guidance in either statement as to the number of escorts required for each convoy. However, a rough estimate can be derived from the 1975 Posture Statement goal of an overall force level of 250 ships, including reserve and Coast Guard vessels, to be achieved in the early 1980s.<sup>9</sup> Subsequent posture statements have not altered these force goals. Since escort requirements for carriers, amphibious forces, and underway replenishment groups would total approximately 180 ships, 70 ships would be needed for convoy escort duties. Each convoy would therefore require 14-15 escorts, included among which would be the Naval Reserve and Coast Guard vessels. It is assumed that the overhaul allowance was included in the desired escort/convoy ratio as derived from the Posture Statement.



ESTIMATED ESCORT REQUIREMENTS BASED ON  
FISCAL YEAR 1975 POSTURE STATEMENT GOAL OF 250 ESCORTS

Carriers:	68 (2 CVN-8 nuclear escorts; 10 CVN/CVA-60 conventional escorts)
Amphibious Assault:	56
Underway Replenishment:	<u>55</u> (9-10 URG)
Subtotal:	179
Convoys:	<u>70</u> (5 convoys)
Total:	249

C. Amphibious Assault Requirements

The fiscal year 1977 Posture Statement indicates that by fiscal year 1979 an amphibious lift force of 66 active ships will be attained,<sup>10</sup> sufficient for a lift capacity of 1-1/3 Marine Amphibious Forces (MAFs). Alternative force requirements will vary with primary reference to the number of MAFs which each option projects.

D. Underway Replenishment Requirements

Underway replenishment force levels reflect the force levels of the warships they service. Variations in the latter therefore will account for variations in underway replenishment requirements. An additional factor affecting the number of required replenishment vessels in different alternatives is the number of nuclear-powered vessels in each. Underway replenishment is not as crucial to nuclear-powered ships as to conventional ones. Nuclear-propelled vessels require no fossil fuel and hence demand no oilers. Nor are their ammunition requirements as great, since they can store more ammunition than similar conventional vessels. Variations in the levels for nuclear-powered ships will therefore contribute to the calculation of underway replenishment requirements in different alternatives.

E. Other Vessels

Tender and repair ship numbers are based on present strengths, with allowances made in the three alternatives for variations in overall escort and submarine numbers.

## Force Levels for 600-Ship Alternative

### A. Carriers and Their Escorts

The highest alternative calls for 14 carriers. As noted above, this force level will allow for the permanent overseas deployment of four task forces. The three-for-one calculation demands but 12 carriers to support these task forces, and the remaining carriers therefore will serve to enhance surge capability during crises.

Alternative decisions regarding Title VIII will affect the number of carrier escorts in this option, as well as the overall escort figure. To determine the effect of Title VIII it must first be noted that the normative calculation for deriving required carrier escort levels assumes that four nuclear escorts will be available for each nuclear carrier, and six conventional escorts for each conventional carrier. As noted above, nuclear-powered escorts could accompany conventional carriers but DoD has not stated a requirement for more nuclear escorts than are needed for nuclear carriers. Expressed in terms of an equation, the normative carrier escort calculation would be:

$$\text{Esc} = (\text{CNuc} \times 4) + ((\text{C} - \text{CNuc}) \times 6)$$

Where

Esc	indicates the total number of carrier escorts
CNuc	indicates nuclear carrier force
C	indicates carrier force

However, there are presently nine nuclear escorts in the fleet or under construction which will be available in 1986. The 600-ship non-Title VIII alternative posits that eight more nuclear escorts will be added to the fleet, in line with Navy testimony before Congress in 1975.<sup>11</sup> The 17 escorts cannot form all nuclear task forces for all eight nuclear carriers projected under this option, since it is only when nuclear escorts are grouped in multiples of four that they can effectively serve to reduce the total number of escorts required for carrier escort duty. There is no mixing of nuclear and conventional ships to achieve task force escort totals of other than four or six escorts per carrier. To determine how many escorts are required when there are not enough nuclear escorts for all nuclear carriers, the total number of nuclear escorts must be divided by four and the quotient expressed as an integer. This integer represents the total number of carriers protected by nuclear escorts. The integer is then multiplied by four to yield the total number of nuclear escorts required for nuclear task force duty. The resultant product is added to the total number of conventionally-escorted task forces, expressed as the product of remaining unescorted carriers multiplied by the number of conventional escorts required for each task force. The equation may be expressed in this way:

$$\text{Esc} = \left( \left\lfloor \frac{\text{NucEsc}}{4} \right\rfloor \times 4 \right) + \left( \left( C - \left\lfloor \frac{\text{NucEsc}}{4} \right\rfloor \right) \times 6 \right)$$

Where  $\left\lfloor \frac{\text{NucEsc}}{4} \right\rfloor \leq \text{CNuc}$

and Esc indicates the total number of carrier escorts  
 NucEsc indicates the total number of nuclear-powered escorts

$\left\lfloor \right\rfloor$  indicates largest integer

C indicates carrier force  
 CNuc indicates nuclear carrier force

The formula specifies that the number of nuclear task forces that are obtainable when dividing the total nuclear escort force by four should not exceed the projected number of nuclear-propelled carriers.

In cases where the number of potential carrier task forces does exceed the number of nuclear carriers in the projected fleet, the equation for the total number of carrier escorts is the same as the original normative equation:

$$\text{Esc} = (\text{CNuc} \times 4) + ((C - \text{CNuc}) \times 6)$$

In this case the "remaining" nuclear escorts, i.e.  $(\text{NucEsc} - (\text{CNuc} \times 4))$  are to be assigned other missions. As noted, the 600-ship alternative calls for eight nuclear-powered carriers in its 14 carrier force. If Title VIII is partly implemented, eight additional strike cruisers (CSGNS) would join nine other nuclear powered vessels already under construction or in the fleet. The calculation would therefore be:

$$(1) \text{Esc} = \left( \left\lfloor \frac{17}{4} \right\rfloor \times 4 \right) + \left( (C - \left\lfloor \frac{17}{4} \right\rfloor) \times 6 \right)$$

$$(2) \left\lfloor \frac{17}{4} \right\rfloor = 4 < 8$$

$$(3) 76 = (4 \times 4) + ((14 - 4) \times 6)$$

If, on the other hand, Title VIII is fully implemented, 26 CSGNs (8 CSGNs and 18 more in place of 18 DDG-47s) would be procured and the calculation is then:

$$(1) \text{Esc} = \left( \left\lfloor \frac{35}{4} \right\rfloor \times 4 \right) + \left( (C - \left\lfloor \frac{35}{4} \right\rfloor) \times 6 \right)$$

$$(2) \left\lfloor \frac{35}{4} \right\rfloor = 8$$

$$(3) 68 = (8 \times 4) + ((14 - 8) \times 6)$$

As the calculations indicate, all eight projected nuclear carriers would have nuclear-powered escort protection.

#### B. Amphibious Assault Vessels and Their Escorts

The 600-ship alternative allows for slightly more vessels than the 66 ships which the fiscal year 1977 posture statement projects as adequate for 1-1/3 Marine Amphibious Forces (MAFs). The additional ships provided under this alternative would allow for less constrained equipment transfer and for a lower number of ships required for transfer to the Atlantic/Mediterranean area for a division-sized assault in the NATO area and its southern flank.

As noted above, a constant level of 56 escorts is assumed for each amphibious assault alternative.

#### C. Underway Replenishment and Their Escorts

As noted above, Secretary Schlesinger projected a total of 10 underway replenishment groups (URGs) for a force of some 250 escorts. Included in that force projection were 12 carriers. Increasing the carrier level to 14 does not imply a greater need for URGs, since the additional carriers would be nuclear-powered and thus independent of oilers. Additionally, as noted above, nuclear carriers can store more ammunition than their conventional counterparts, thereby reducing their reliance upon ammunition ships. Since under the high alternative at least eight of the projected additional escorts will be nuclear-powered strike cruisers, the 10 URG level, with 6 ships per URG, is sufficient for the force.<sup>12</sup> Adopting full Title VIII implementation will not, however, allow for further URG reductions, since the ratio of conventional ships to oilers would markedly worsen if any oilers were dropped from the procurement program.<sup>13</sup> Six escorts would be provided for each URG.

#### D. Other Vessels and Convoy Escorts

The number of destroyer and submarine tenders, repair and rescue ships increases under this alternative in line with the growth in warship and submarine levels. The SURTASS (surveillance towed array sensor system) vessels are included in the strengths that the fiscal year 1977 Posture Statement has projected for the fiscal years 1977-81 program.<sup>14</sup> Although the statement projects only 10 mine countermeasures ships as opposed to the 15 in Appendix Table A, it is likely that that level would be increased were the Navy to expand to approximately 600 vessels.

The fiscal year 1975 Posture Statement seemed to indicate that a total of about 70 convoy escorts was required for five convoys. Included in that total were 37 Naval Reserve destroyers and 12 Coast Guard

cutters with some antisubmarine capability.<sup>15</sup> The number of Naval Reserve Force (NRF) destroyers has declined from 37 to 30 and is likely to remain at the latter level during the 1980s, as destroyers retired from the active fleet replace older NRF vessels. The Coast Guard force will remain active and intact until the late 'eighties, so that a total of about 30 additional ships will be required to complete the convoy escort force.

#### E. Escort Totals

It will be seen that Title VIII affects the level of carrier escorts only. Total active Navy escort levels will stand at either 222 or 214 depending on the degree of implementation of Title VIII. In terms of procurement requirements, full implementation of Title VIII, with more strike cruisers procured, will yield a lower overall force level and will allow for eight fewer FFG procurements (see Appendix Table B).

### Force Levels for 500-Ship Alternative

#### A. Carriers and Their Escorts

This alternative calls for 12 carriers, 6 of them nuclear. The three-for-one carrier calculation indicates that 4 carriers can be permanently on station overseas simultaneously.

Once again, as with the higher option, differing decisions on Title VIII will affect the size of the carrier escort force (see Appendix Table B). Should Title VIII be partly implemented, only two strike cruisers (CSGNs) would be procured as part of the AEGIS-air defense warship force in line with the projection of the fiscal year 1977 Posture Statement.<sup>16</sup> There would thus be a total of 11 nuclear-powered escorts in the fleet.

Employing the escort-force equation, it can be seen that only two nuclear-powered task forces can be formed; that the other four nuclear carriers will have conventional escorts; and that a total of 68 escorts are needed for the entire carrier force.

$$(1) \text{ Esc} = \left( \left\lceil \frac{11}{4} \right\rceil \times 4 \right) + \left( (C - \left\lceil \frac{11}{4} \right\rceil) \times 6 \right)$$

$$(2) \left\lceil \frac{11}{4} \right\rceil < 6$$

$$(3) 68 = (2 \times 4) + ((12 - 2) \times 6)$$

The three nuclear powered escort ships not attached to carriers would be available for "independent" as well as amphibious assault escort duties.

If Title VIII is fully implemented, 22 additional CSGNs would enter the fleet, in place of 22 DDGs, and bring the nuclear effort level up to 33. As noted above, there will be but six nuclear carriers in this option. Performing the first two steps of the escort-force calculation reveals that the available nuclear escorts could form more than six nuclear task forces.

$$(1) \text{ Esc} = \left( \left\lceil \frac{33}{4} \right\rceil \times 4 \right) + \left( (C - \left\lceil \frac{33}{4} \right\rceil) \times 6 \right)$$

$$(2) \left\lceil \frac{33}{4} \right\rceil > 6$$

Nuclear escorts could accompany conventional carriers, but as noted above, DoD has not stated a requirement for more nuclear escorts than are needed for the nuclear carriers. Thus the maximum number of nuclear task forces is six, and that figure must be inserted into the equation. Step three of the calculation reveals that 60 escorts are required for a 500-ship, full Title VIII option.

$$(2a) \text{ Esc} = (6 \times 4) + ((C - 6) \times 6)$$

$$(3) 60 = (6 \times 4) + ((12 - 6) \times 6)$$

There remain nine nuclear-powered escort ships. Again, these could serve as "independent" units or as amphibious assault escorts.

#### B. Amphibious Assault Vessels and Their Escorts

The 500-ship alternative numerically approximates the amphibious assault capability which the fiscal year 1977 Posture Statement projects for the 1980s.<sup>17</sup> However, it actually has fewer transport and landing ships and therefore yields a smaller assault load--something more than one MAF, but short of the 1-1/3 level. It does, however, approximate present capacity.

Again, 56 escorts are required for the Amphibious Assault force.

#### C. Underway Replenishment Vessels and Their Escorts

The 500-ship Navy, with fewer major combatants overall, would appear to require fewer URGs than the fiscal year 1975 Posture Statement projects. The projected seven to eight URGs represent a reduction in proportion to the reduction of oil-fired task groups for this alternative. Six escorts are provided for each URG.

#### D. Other Vessels and Convoy Escorts

The 500-ship alternative calls for no additional new submarine construction. Nevertheless, the submarine force level will ultimately be higher than at present--and additional tenders are necessary. The destroyer tender level likewise is augmented to reflect an increase in the number of destroyers in the fleet. The mine countermeasure and fleet ocean tug levels approximate present Navy force projections.

If Title VIII is partly implemented, only 25 escorts are available for direct assignment to convoys. In other words, only five active fleet escorts can be assigned to each convoy. The total convoy escort force, including projected NRF and Coast Guard ships, will only be 65 ships. To reach an escort force of 70, five additional older escorts will have to be retained in the NRF.

#### E. Escort Totals

Title VIII affects both carrier and convoy escort force levels, as has just been outlined. Full implementation will allow for a reduction of the active Navy escort force level from 197 to 189 vessels. The FFG procurement program can therefore be reduced by eight ships.

### Force Levels for 400-Ship Alternative

#### A. Carriers and Their Escorts

This alternative proposes a force of 10 carriers, 4 of them nuclear. Only three carriers could be maintained on station overseas with this force level. The remaining carrier (over nine required to maintain three deployed) would serve to augment the fleet's surge capability.

Title VIII will again influence carrier escort levels, as Appendix Table C reveals. As with the 500-ship option, only two CSGNs would be procured during fiscal years 1977-81 if Title VIII is partly implemented, and the result is the same: two all nuclear task forces are possible. The total escort level would be 52.

$$(1) \text{ Esc} = \left( \left\lceil \frac{11}{4} \right\rceil \times 4 \right) + \left( \left( C - \left\lceil \frac{11}{4} \right\rceil \right) \times 6 \right)$$

$$(2) \left\lceil \frac{11}{4} \right\rceil < 4$$

$$(3) 56 = (2 \times 4) + ((10 - 2) \times 6)$$

Again, the three nuclear-powered escort ships not attached to carriers would be available for "independent" and amphibious assault duties.

If Title VIII is fully implemented, 18 CSGNs would enter the fleet and bring the total nuclear escort force level up to 27. With but four carriers in this option, there will remain 11 nuclear escorts after all nuclear task forces have been accounted for:<sup>18</sup>

$$(1) \text{ Esc} = \left( \left\lceil \frac{27}{4} \right\rceil \times 4 \right) \times \left( (C - \left\lceil \frac{27}{4} \right\rceil) \times 6 \right)$$

$$(2) \left\lceil \frac{27}{4} \right\rceil > 4$$

$$(2a) \text{ Esc} = (4 \times 4) \times ((C - 4) \times 6)$$

$$(3) 52 = (4 \times 4) (6 \times 6)$$

These nuclear escorts could serve as independent units or amphibious assault escorts, or indeed as underway replenishment escorts.

#### B. Amphibious Assault Vessels and Their Escorts

The 400-ship alternative further reduces the number of transport ships in the fleet from that which is provided in the 500-ship option and substantially reduces the number of tank landing ships as well. The resultant force would allow for the transport of one MAF, with additional flexibility provided by NRF vessels.

Escort levels remain the same, however, at 56 vessels.

#### C. Underway Replenishment Ships and Their Escorts

The 400-ship alternative, with still fewer major combat vessels than that of 500-ships, would require correspondingly fewer URGs. Again, it should be noted that even without full implementation of Title VIII, five additional nuclear surface ships will be entering the fleet by 1986 (including two aircraft carriers), thereby further lessening the need for fuel, stores, and ammunition ships.

Six URGs would require 36 escorts.

#### D. Other Vessels and Convoy Escorts

While both the "baseline" and 400-ship alternatives have the same number of submarines (those already in the fleet plus those authorized in previous fiscal years) the lower alternative is provided with a more austere force that involves no increase in the tender force levels. Two new destroyer tenders must be built, however, to replace vessels that will be obsolescent by 1986. No mine countermeasure ships or SURTASS craft appear in this option.



Active convoy escort levels will be considerably smaller than will the other options, because the only new escort construction undertaken will be the 18-ship AEGIS air-defense platform program. Thus, if Title VIII is partly implemented, the total escort force of 164 ships (146 vessels already authorized plus 18 AEGIS vessels) will allow for 16 escorts to be specifically assigned to convoys. If, however, Title VIII is fully implemented, four additional vessels can be assigned to convoy escort duty, since 18 new vessels would still be procured, but four fewer carrierescorts would be required.

## APPENDIX TABLE A

600-SHIP NAVY: 602/594<sup>a</sup> VESSELS

<u>Task Forces: CV (14)</u>	<u>Amphibious Assault (Full 1-1/3 Divisions)</u>
8 CVN	5 LHA
6 CVA	15 LSD
76/68 <sup>a</sup> Escorts	20 LST
	2 LCC
	6 LKA
<u>Underway Replenishment</u>	14 LPD
18 AE	<u>7 LPH</u>
14 AFS	69 Amp. As.
15 AO	56 Escorts
7 AOR	
<u>6 AOE</u>	<u>Other</u>
60 Un. Rep. (10 URG)	30 Convoy Escorts
60 Escorts	5 Patrol Gunboats
	6 Missile Boats
<u>Submarines</u>	15 Mine Countermeasures
95 SSN	12 AGOS-SURTASS
41 SSBN	14 AS
	2 ASR
	11 AD
	13 ATS/ATF
	6 ARS
	6 AR
a. Full compliance with Title VIII.	11 Misc.

APPENDIX TABLE B

## 600-SHIP OPTION

Type	Obsolescent <sup>a</sup>	Remaining <sup>b</sup>	Program	To Build	Redundant <sup>c</sup>
CVN	5	10	14	4	-
CSGN	-	-	8	8	-
(CSGN Title VIII	-	-	26	26	-)
CRU/DES	14	77	95	18	-
(CRU/DES Title VIII	14	77	77	-	-)
DE/FF	2	69	119	50	-
(DE/FF Title VIII	2	69	111	42	-)
Amp. Assault	7	62	69	9 (LSD)	2 (LPA)
Un. Rep.	8	40	60	20 (4AE 7AFS 7AO 2AOE)	-
PG	-	11	5	-	6
PHM	-	6	6	-	-
MCM	-	-	15	15	-
AGOS	-	-	12	12	-
ATS/ATF	18	3	13	10	-
AD	4	5	11	6	-
AS	2	9	14	5	-
ASR	6	2	2	-	-
AR/ARS	16	1	12	11	-
Misc. <sup>d</sup>	1	11	11	-	-
SSN	-	82	95	13	-
SSBN	-	41	41	-	-
TOTAL	83	429	602	181	8
(TOTAL (Title VIII)	83	429	594	173	8)

a. Number of ships having reached obsolescence by 1986.

b. Number of ships remaining in fleet by 1986.

c. Number of ships remaining in fleet by 1986 which would not be necessary to program and could be committed to Naval Reserve Force or Military Sealift Command.

d. Miscellaneous: 1 training carrier (CVT); 1 guided missile ship (AVM); 1 miscellaneous command ship (AGF); 3 miscellaneous ships (AG); 1 deep submergence support ship (AGDS); 1 frigate research ship (AGFF); 1 hydrofoil research ship (AGEH); 1 auxiliary submarine (AGSS); 1 hospital ship (AH).

## APPENDIX TABLE C

500-SHIP NAVY: 514/506 VESSELS

<u>Task Forces: CV (12)</u>	<u>Amphibious Assault (1+ Division)</u>
6 CVN	5 LHA
6 CVA	13 LSD
68/60 <sup>a</sup> Escorts	20 LST
	2 LCC
<u>Underway Replenishment</u>	6 LKA
14 AE	12 LPD
8 AFS	<u>7 LPH</u>
13 AO	65 Amp. As.
7 AOR	56 Escorts
<u>4 AOE</u>	
46 Un. Rep. (7/8 URG)	<u>Other</u>
48 Escorts	25 Escorts
	5 Patrol Gunboats
<u>Submarines</u>	6 Missile Boats
82 SSN	10 Mine Countermeasure
41 SSBN	11 AS
	10 AD
	12 ATS/ATF
	6 AR/ARS
	11 Misc.

a. Full compliance with Title VIII.

APPENDIX TABLE D

## 500-SHIP OPTION

Type	Obsolescent <sup>a</sup>	Remaining <sup>b</sup>	Program	To Build	Redundant <sup>c</sup>
CVN	5	10	12	2	-
CSGN	-	-	2	2	-
(CSGN Title VIII	-	-	24	24	-)
CRU/DES	14	77	99	22	-
(CRU/DES Title VIII	14	77	77	-	-)
DE/FF	2	69	96	27	-
(DE/FF Title VIII	2	69	88	19	-)
Amp. Assault	7	62	65	7 (LSD)	4 (2LPD 2LPA)
Un. Rep.	8	40	46	6 (1AFS 5 AO)	-
PG	-	11	5	-	6
PHM	-	6	6	-	-
MCM	-	-	10	10	-
ATS/ATF	18	3	12	9	-
AD	4	5	10	5	-
AS	2	9	11	2	-
ASR	6	2	-	-	2
AR/ARS	16	1	6	5	-
Misc. <sup>d</sup>	1	11	11	-	-
SSN	-	82	82	-	-
SSBN	-	41	41	-	-
TOTAL	83	429	514	97	12
(TOTAL (Title VIII)	83	429	506	89	12)

a. Number of ships having reached obsolescence by 1986.

b. Number of ships remaining in fleet by 1986.

c. Number of ships remaining in fleet by 1986 which would not be necessary to program and could be committed to Naval Reserve Force or Military Sealift Command.

d. Miscellaneous: 1 training carrier (CVT); 1 guided missile ship (AVM); 1 miscellaneous command ship (AGF); 3 miscellaneous ships (AG); 1 deep submergence support ship (AGDS); 1 frigate research ship (AGFF), 1 hydrofoil research ship (AGEH); 1 auxiliary submarine (AGSS); 1 hospital ship (AH).

## APPENDIX TABLE E

400-SHIP NAVY: 434 VESSELS

<u>Task Forces: CV (10)</u>	<u>Amphibious Assault (1 Division)</u>
4 CVN	5 LHA
6 CVA	10 LSD
56/52 <sup>a</sup> Escorts	14 LST
	2 LCC
<u>Underway Replenishment</u>	6 LKA
11 AE	10 LPD
7 AFS	<u>7 LPH</u>
8 AO	54 Amp. Ass.
7 AOR	56 Escorts
<u>4 AOE</u>	
37 Un. Rep. (6 URG)	<u>Other</u>
36 Escorts	16/20 <sup>a</sup> Convoy Escorts
	6 Missile Boats
<u>Submarines</u>	9 AS
82 SSN	7 AD
41 SSBN	10 ATS/ATF
	4 AR/ARS
	10 Misc.

a. Full compliance with Title VIII.

APPENDIX TABLE F

## 400-SHIP OPTION

Type	Obsolescent <sup>a</sup>	Remaining <sup>b</sup>	Program	To Build	Redundant <sup>c</sup>
CVN	5	10	10	-	-
CSGN	-	-	2	2	-
( CSGN Title VIII	-	-	18	18	- )
CRU/DES	14	77	93	16	-
( CRU/DES Title VIII	14	77	77	-	- )
DE/FF	2	69	69	-	-
( DE/FF Title VIII	2	69	69	-	- )
Amp. Assaults	7	62	54	4 (LSD)	12 6 LST 4 LPD 2 LPA
Un. Rep.	8	40	37	-	3 (AE)
PG	-	11	-	-	11
PHM	-	6	6	-	-
ATS/ATF	18	3	10	7	-
AD	4	5	7	2	-
AS	2	9	9	-	-
ASR	6	2	-	-	2
AR/ARS	16	1	4	3	-
Misc. <sup>d</sup>	1	11	10	-	1 (AG)
SSN	-	82	82	-	-
SSBN	-	41	41	-	-
TOTAL	83	429	434	34	29
( TOTAL (Title VIII)	83	429	434	34	29 )

a. Number of ships having reached obsolescence by 1986.

b. Number of ships remaining in fleet by 1986.

c. Number of ships remaining in fleet by 1986 which would not be necessary to program and could be committed to Naval Reserve Force or Military Sealift Command.

d. Miscellaneous: 1 training carrier (CVT); 1 guided missile ship (AVM); 1 miscellaneous command ship (AGF); 2 miscellaneous ships (AG); 1 deep submergence support ship (AGDS); 1 frigate research ship (AGFF); 1 hydrofoil research ship (AGEH); 1 auxiliary submarine (AGSS); 1 hospital ship (AH).

## APPENDIX A FOOTNOTES

1. See Arnold M. Kuzmack, Naval Force Levels and Modernization: An Analysis of Shipbuilding Requirements (Washington, D.C.: Brookings Institution, 1971), pp. 36-43.
2. Robert S. McNamara, The Fiscal Years 1969-1973 Defense Program and the 1969 Defense Budget (January 22, 1968), p. 126.
3. Kuzmack, Naval Force Levels, pp. 38-39.
4. The 1963 fleet included approximately 130 amphibious assault vessels; Kuzmack's estimates represent about a 35 percent decline from this level. The estimates in this paper represent a 25 percent decline from Kuzmack's levels, ibid., pp. 125-126.
5. Ibid.
6. Schlesinger, Annual DoD Report, FY 1975, pp. 140-42.
7. Ibid., p. 126.
8. Rumsfeld, Annual DoD Report, FY 1977, p. 164.
9. Schlesinger, Annual DoD Report, FY 1975, p. 126.
10. Rumsfeld, Annual DoD Report, FY 1977, p. 175.
11. Testimony of Admiral Whittle before Task Force on National Security Programs of the House Committee on the Budget, Hearings, 94-1, Part 1, 1975, p. 109.
12. The table on Appendix page 63 indicates that only 55 escorts were posited for what the fiscal year 1975 Posture Statement terms "about 10" URGs, not 60 escorts as in the above option. The former posits a somewhat smaller underway replenishment force than the "600 ship" option projects.
13. For full discussion of this point see main text, pp. 29-30.
14. Rumsfeld, Annual DoD Report, FY 1977, p. 168.
15. Schlesinger, Annual DoD Report, FY 1975, p. 126.
16. Rumsfeld, Annual DoD Report, FY 1977, p. 168.
17. Rumsfeld, Annual DoD Report, FY 1977, pp. 174-75.



18. See pp. 64-65 of Appendix for a discussion of the relationship between nuclear escorts and maximum carrier force totals.

# APPENDIX B

## SHIPS DELIVERED AFTER JULY 1, 1973

Type	FY	Contractor	4/1/71	Estimated Delivery Date As Of: 4/1/72	7/1/73	4/30/74	4/30/75	Lag in Projected or Actual Delivery from 4/1/71 Estimate
AOR-6	67	GD/Quincy	10/72	4/73	8/73	De1 8/73		10 mos.
AOR-7	72	National			12/75	12/75	5/76	6 mos.
ASR-22	68	Alabama	12/71	6/72	7/73	De1 6/73		18 mos.
CVN-68	67	Newport News	9/73	9/73	3/74	4/75	De1 5/75	20 mos.
CVN-69	70	Newport News	6/75	6/75	12/75	12/76	6/77	24 mos.
*DD-963	70	Litton	10/74	10/74	10/74	10/74	6/75(De1 9/75)	11 mos.
DD-964	70	Litton	4/75	4/75	4/75	4/75	10/75	8+ mos.
DD-965	70	Litton	6/75	6/75	6/75	6/75	12/75	6+ mos.
DD-966	71	Litton	7/75	7/75	7/75	7/75	5/76	10 mos.
DD-967	71	Litton	10/75	10/75	10/75	10/75	7/76	9 mos.
DD-971	71	Litton	7/76	7/76	7/76	7/76	6/77	11 mos.
DD-978	72	Litton			3/77	3/77	3/78	12 mos.
DD-979	74	Litton				4/77	6/78	14 mos.
DD-980	74	Litton				5/77	8/78	15 mos.
DD-981	74	Litton				7/77	11/78	16 mos.
DD-982	74	Litton				8/77	1/79	17 mos.
DE 1091	67	Avondale	3/73	3/73	6/73	De1 6/73		3 mos.
DE 1092	67	Avondale	5/73	5/73	8/73	De1 7/73		2 mos.
DE 1093	67	Avondale	7/73	7/73	10/73	De1 11/73		2 mos.
DE 1094	67	Avondale	9/73	9/73	12/73	De1 1/74		4 mos.
DE 1095	67	Avondale	11/73	11/73	2/74	6/74	De1 6/74	7 mos.
DE 1096	67	Avondale	1/74	2/74	3/74	7/74	De1 7/74	6 mos.
DE 1097	67	Avondale	3/74	4/74	4/74	9/74	De1 9/74	6 mos.
DLGN 36	67	Newport News	12/72	4/73	12/73	De1 2/74		14 mos.
DLGN 37	68	Newport News	8/73	1/74	10/74	1/75	De1 1/75	17 mos.
DLGN 38	70	Newport News	Not Awarded	5/75	12/75	2/76	4/76	11 mos.
DLGN 39	71	Newport News	Not Awarded	1/76	8/76	10/76	1/77	12 mos.
DLGN 40	72	Newport News		9/76	4/77	6/77	9/77	12 mos.
PF 109	73	Bath			Not Awarded	3/77	6/77	3 mos.

LHA 1	69	Litton	4/74	4/74	3/75	3/75	10/75	18+ mos.
LHA 2	70	Litton	7/74	7/74	10/75	9/75	6/76	23 mos.
LHA 3	70	Litton	12/74	12/74	2/76	3/76	6/77	30 mos.
LHA 4	71	Litton	2/75	2/75	7/76	7/76	5/78	39 mos.
LHA 5	71	Litton	6/75	6/75	12/76	12/76	4/79	46 mos.
PHM 1	73	Boeing			Not Awarded	6/75	12/75	6+ mos.
SSN 682	67	Litton	9/73	9/73	1/74	Del 1/74		4 mos.
SSN 683	68	Litton	9/73	4/74	7/74	8/74	Del 8/74	11 mos.
SSN 685	68	EB	12/73	6/74	8/74	11/74	Del 12/74	12 mos.
SSN 686	69	Newport News	12/73	12/73	5/74	9/74	Del 2/75	14 mos.
SSN 687	69	Newport News	4/74	4/74	1/75	6/75	8/75	16 mos.
**SSN 688	70	Newport News			8/74	6/75	11/75	15 mos.
SSN 689	70	Newport News			5/75	2/76	7/76	14 mos.
SSN 690	70	EB			6/75	12/75	2/76	8 mos.
SSN 691	71	Newport News			9/75	9/76	1/77	16 mos.
SSN 692	71	EB			10/75	6/76	12/76	14 mos.
SSN 693	71	Newport News			2/76	4/77	7/77	17 mos.
SSN 694	71	EB			2/76	10/76	4/77	14 mos.
SSN 696	72	EB			6/76	1/77	9/77	15 mos.
SSN 699	72	EB			6/77	9/77	7/78	13 mos.
SSN 700	73	EB			Not Awarded	10/77	8/78	10 mos.
SSN 702	73	EB			Not Awarded	7/78	3/79	8 mos.
SSN 706	74	EB				9/79	1/80	4 mos.
SSN 707	74	EB				1/80	4/80	3 mos.

Notes: Del - Delivered

GD/Quincy - General Dynamics Corp, Quincy, Massachusetts

National- National Steel and Shipbuilding Co., San Diego, California

Alabama - Alabama Dry Dock and Shipbuilding Co., Mobile, Alabama

Newport News - Newport News Shipbuilding and Dry Dock Co., Newport News, Virginia

Litton - Litton Ships System Division, Litton Industries, Pascagoula, Mississippi

Avondale - Avondale Shipyards, Inc., New Orleans, Louisiana

Bath - Bath Iron Works Corporation, Bath, Maine

Boeing - Boeing Company, Seattle, Washington

EB - General Dynamics/Electric Boat Division, Groton, Connecticut

\* Representative Sample - DD963 Class

\*\*Representative Sample - SSN688 Class

Source: House Committee on Appropriations, Hearings, Department of Defense Appropriations, FY 1972, FY 1973, FY 1974, FY 1975, FY 1976 (1971-75)

