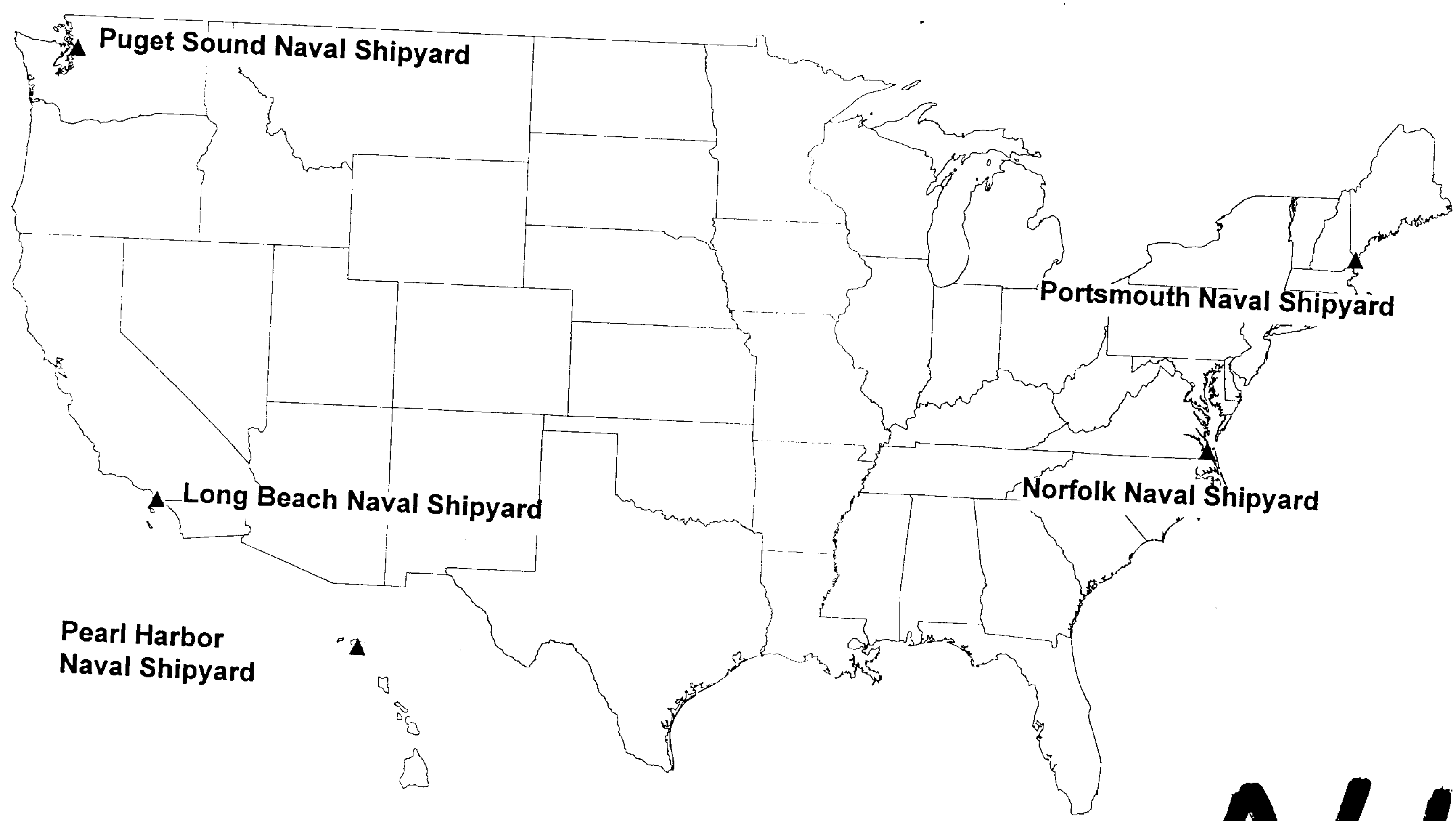
Naval Shipyards



DCN 195

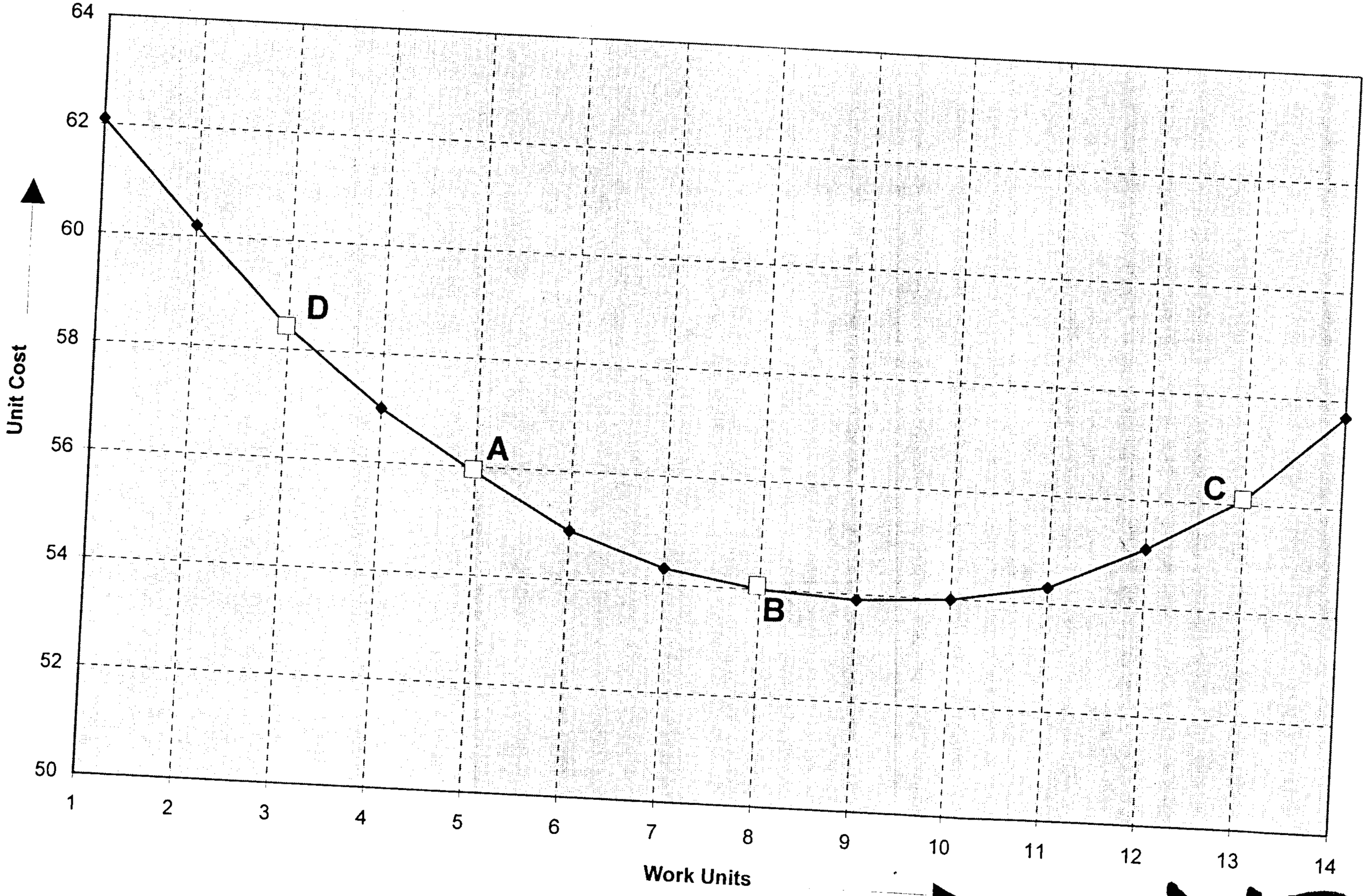
N1

Capacity
Background

- Physical constraints
  - graving docks--number & size, dock maintenance, setting blocks
- Type of work--you can't put as many workers on a boat as on a ship
  - subsafe procedures, nuclear work
- Efficiency curves

N2

Depot Econometric Curve



N3

Capacity
Navy Analysis

- Measured in thousands of direct labor man (work) years--DLMYs
- Based on 8-hour shift, 5-day week
  - shipyards generally work at least 2 shifts
- Predicted Capacity =Predicted Use
  - Annual budgeted (scheduled) workload 2001
  - Selected year is FY 2001

N4

Navy Capacity (cont.)

- Maximum capacity--No surplus remaining
  - projected workload remains as assigned
  - max hiring, max training, max equipment
  - no major MILCON not programmed
  - no significant increase in overhead/rates
  - must meet current commitments
- Maximum capacity somewhat theoretical
- Excess Capacity = Maximum - Predicted

N5

688-Class SSNs

- 62 procured by Navy
  - 4 not yet delivered, 2 inactivated
  - Flight I (31 boats): ~15-year nuclear cores
  - Flight II (31 boats): ~30-year cores
- Refueling complete/in prog: 2/1 boats
- In cue: 14 boats
  - 6 PNSY, 4 NNSY, 4 PHNSY
  - other 14 budgeted for inac/defueling
- **FY 2005 last sked refueling in a NSY**

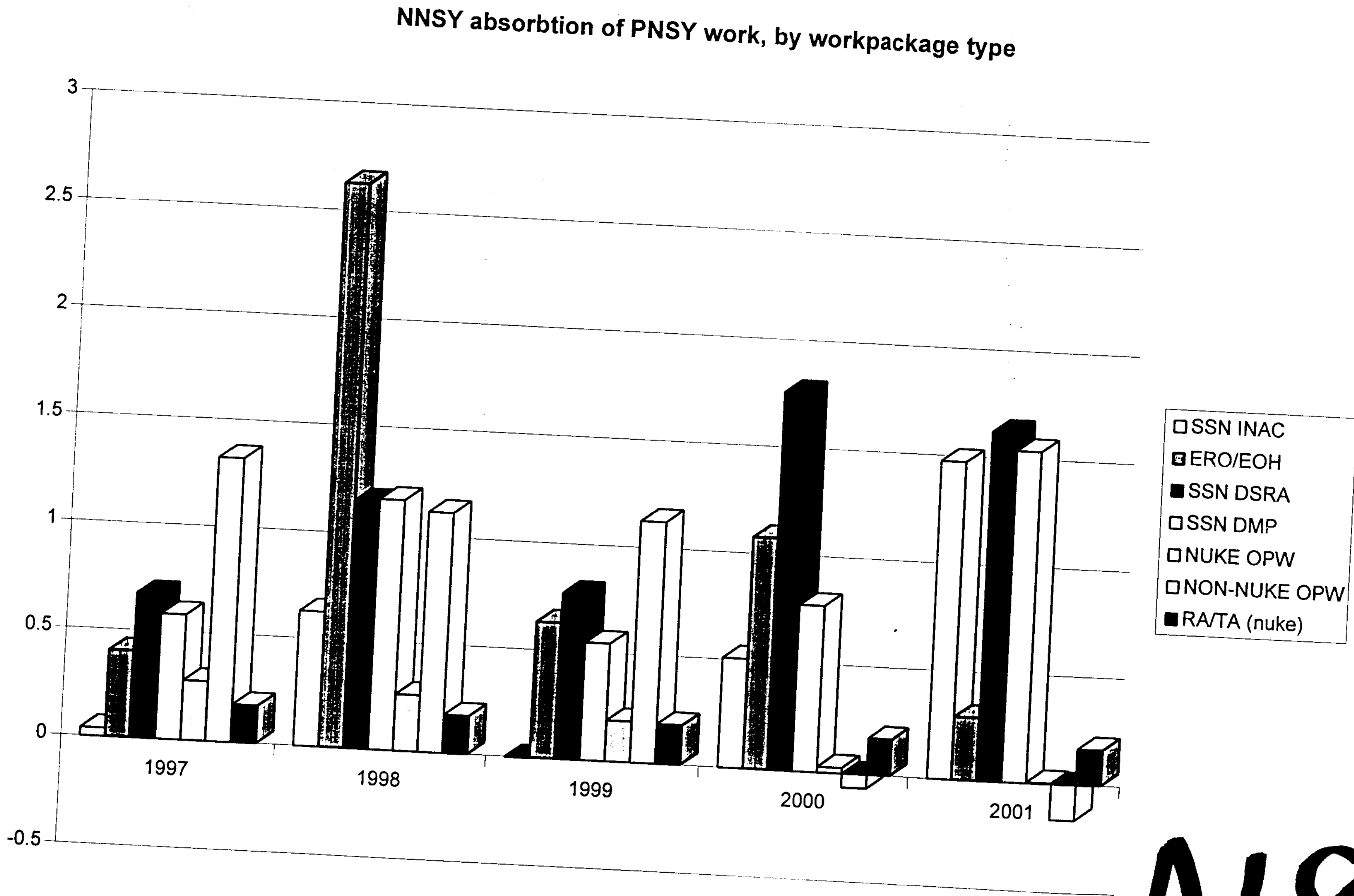
N6

Naval Shipyard Drydocks:
SSN-688 Refueling Capabilities

Shipyard	Total Drydocks	Facilitized for Defueling Only	Facilitized for Refueling	Refueling Options*
Norfolk	8	1	1	2
Portsmouth	3	1	1	0
Puget Sound	6	1	0	3
Pearl Harbor	4	0	1 (in progress)	1

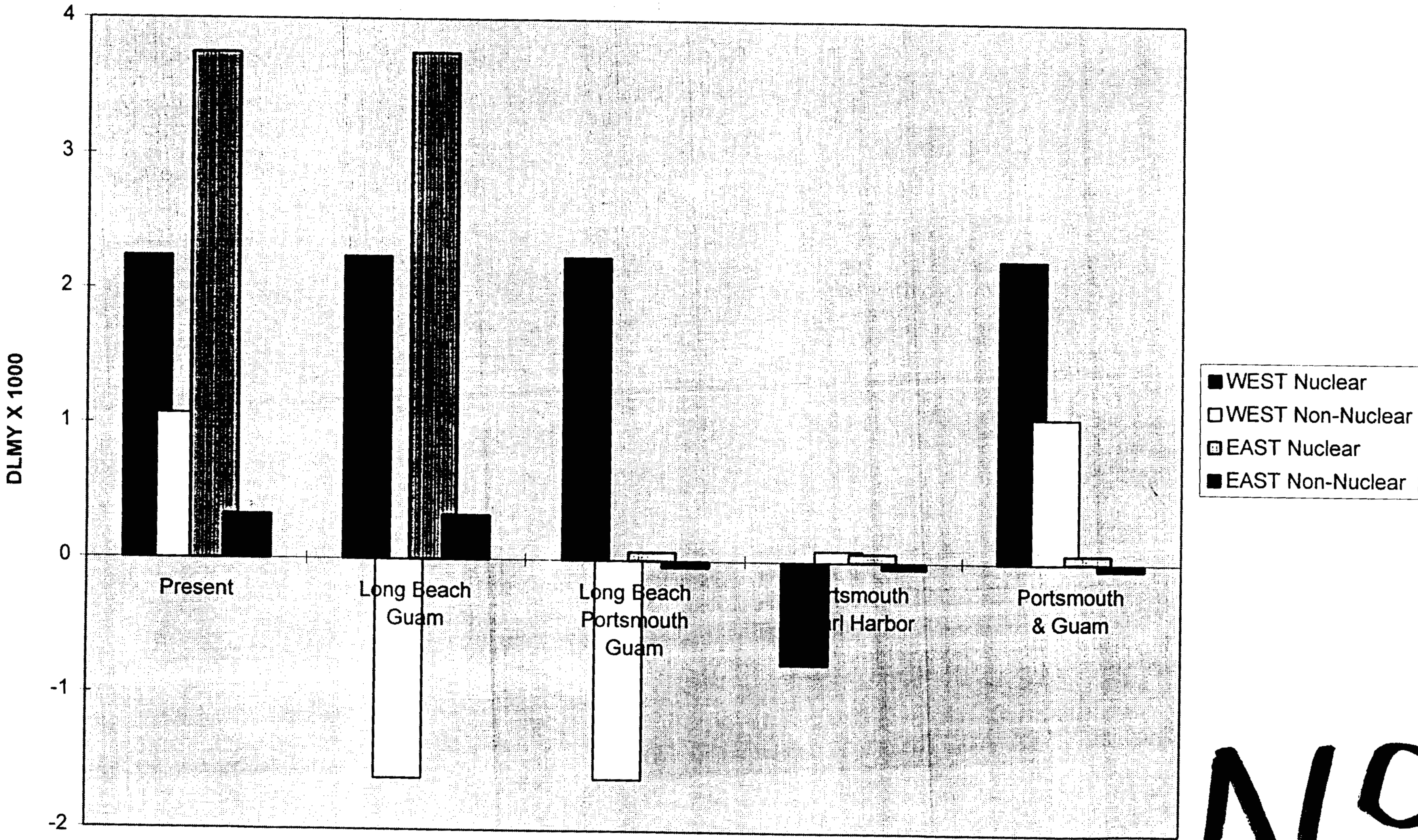
* Does not include carrier drydocks

N7


NNSY absorbtion of PNSY work, by workpackage type
3
2.5
2
1.5
1
0.5
0
-0.5
1997
1998
1999
2000
2001
SSN INAC
ERO/EOH
SSN DSRA
SSN DMP
NUKE OPW
NON-NUKE OPW
RA/TA (nuke)

N8

Excess Capacity by Coast



N9

Document Separator

NAVY CATEGORIES

CATEGORY	NUMBER	CATEGORY	NUMBER
Guam Installations	**5**	**Fleet and Industrial Supply Centers**	**9**
Naval Bases	15	**Public Works Centers**	**8**
Marine Corps Bases	3	Construction Battalion Centers	2
Operational Air Stations	**26**	Naval Security Group Activities	4
Reserve Air Stations	**6**	Integrated Undersea Surveillance System Facilities	2
Reserve Activities	**286**	Naval Computer and Telecommunications Stations	17
Training Air Stations	**5**	Naval Meteorology and Oceanography Centers	6
Training/Educational Centers	**32**	Medical Activities	142
Naval Aviation Depots	**3**	Dental Activities	104
Naval Shipyards	**6**	Military Sealift Command Activities	2
Ordnance Activities	11	**Technical Centers/Laboratories**	**65**
Marine Corps Logistics Bases	2	**Administrative Activities**	**36**
Inventory Control Points	2	**Engineering Field Divisions/Activities**	**9**
Shore Intermediate Maintenance Activities	14	**Supervisors of Shipbuilding, Conversion and Repair**	**13**

Highlighted categories have installations DoD has recommended for closure or realignment or Commission has added for further consideration for closure or realignment.

Naval Shipyard, Norfolk Detachment, Philadelphia, PA

DOD RECOMMENDATION: Change the recommendation of the 1991 Commission relating to the closure of the Philadelphia Naval Shipyard (1991 Commission Report, at page 5-28) to delete "and preservation" (line 5) and "for emergent requirements" (lines 6-7).

CRITERIA	PHILADELPHIA, PA (RD)
MILITARY VALUE	N/A
FORCE STRUCTURE	No impact
ONE-TIME COSTS ($ M)	.032
ANNUAL SAVINGS ($ M)	8.78
RETURN ON INVESTMENT	1996 (Immediate)
NET PRESENT VALUE	134.7
BASE OPERATING BUDGET ($ M)	N/A
PERSONNEL ELIMINATED (MIL / CIV) PERSONNEL REALIGNED (MIL / CIV)	N/A N/A
ECONOMIC IMPACT (BRAC 95 / CUM)	0%/0%
ENVIRONMENTAL	No Impact

Naval Shipyard, Norfolk Detachment, Philadelphia, PA

- Cost to maintain drydocks
  - $8.777M annually
- Decreased need for drydocks
  - Carrier drydocks at Norfolk Naval Shipyard and Newport News Shipbuilding
- Supports community reuse

Supervisors of Shipbuilding, Conversion, and Repair

DOD RECOMMENDATION: Disestablish SUPSHIP Long Beach, CA. Relocate certain functions, personnel, and equipment to SUPSHIP San Diego, CA.

COMMISSION ALTERNATIVE RECOMMENDATION: Close SUPSHIP San Francisco, CA.

CRITERIA	LONG BEACH, CA (C)	SAN FRANCISCO, CA (*)
MILITARY VALUE	27.6	30.14
FORCE STRUCTURE	N/A	N/A
ONE-TIME COSTS ($ M)	0.3	0.39
ANNUAL SAVINGS ($ M)	0.3	0.55
RETURN ON INVESTMENT	1998 (1 year)	1999 (1 year)
NET PRESENT VALUE	3.3	6.8
BASE OPERATING BUDGET ($ M)	63.7 (Shipyard Budget)	0.79
PERSONNEL ELIMINATED (MIL / CIV)	6 / 0	7 / 30
PERSONNEL REALIGNED (MIL / CIV)	5 / 8	0 / 0
ECONOMIC IMPACT (BRAC 95 / CUM)	0.0% / 0.4%	0.0% / 0.6%
ENVIRONMENTAL	None	None

Supervisor of Shipbuilding, Conversion and Repair, Long Beach, CA

- Already downsizing to meet workload
- SUPSHIP San Diego can cover requirements

Supervisor of Shipbuilding, Conversion and Repair, San Francisco

- Removed for reasons of economic impact
- Decreasing workload
  - Due to closure of Bay Area homeports
  - Planned for transfer to detachment status

Naval Undersea Warfare Center
Keyport, WA

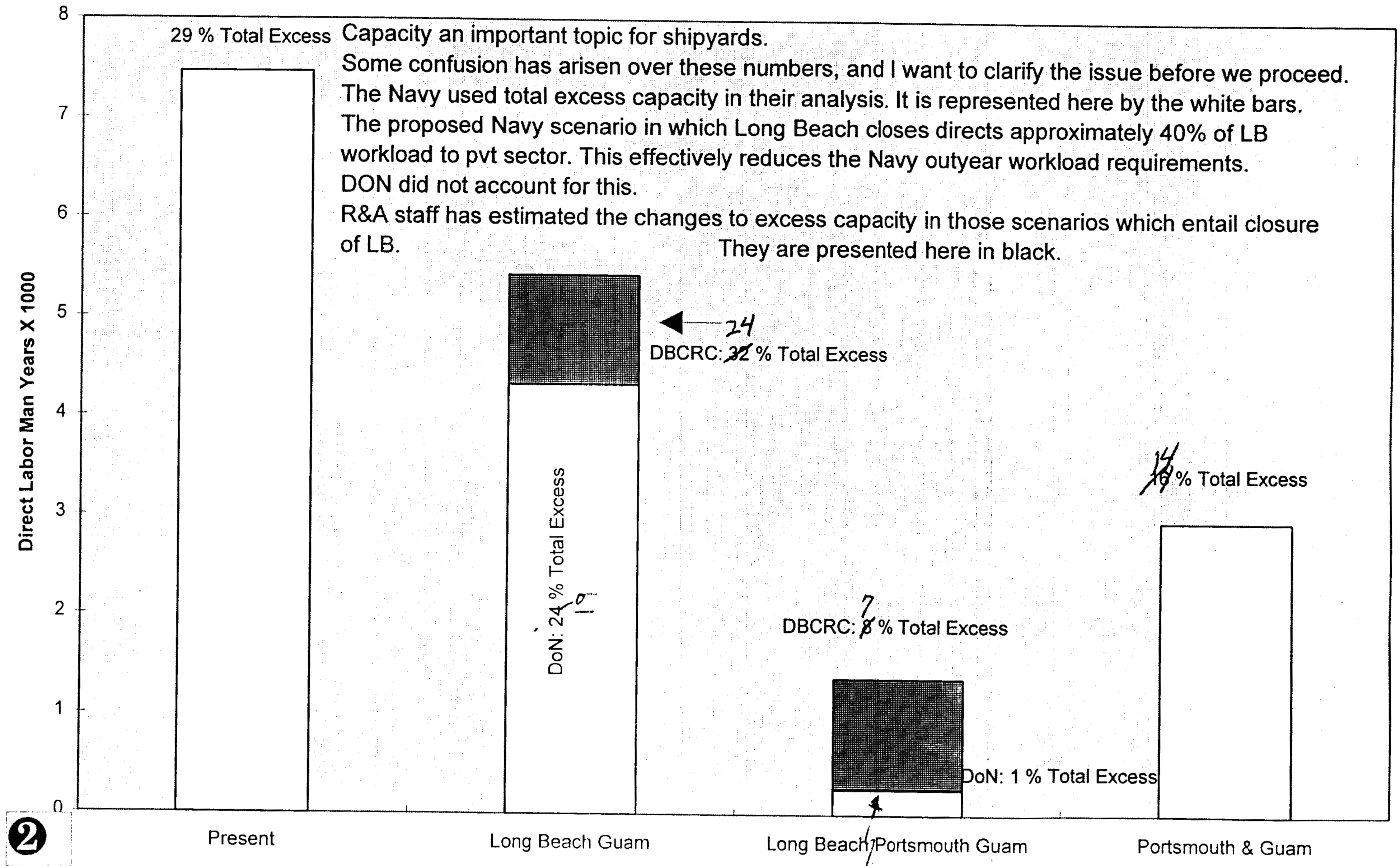
DOD RECOMMENDATION: Realign Naval Undersea Warfare Center, Keyport, WA by moving its ships' combat systems refurbishment depot maintenance and general industrial workload to Naval Shipyard, Puget Sound, Bremerton, WA.

CRITERIA	NUWC KEYPORT, WA (R)
MILITARY VALUE	2 of 4
FORCE STRUCTURE	N/A
ONE-TIME COSTS ($ M)	2.1
ANNUAL SAVINGS ($ M)	2.1
RETURN ON INVESTMENT	1998 (1 year)
NET PRESENT VALUE	29.7
BASE OPERATING BUDGET ($ M)	35.5
PERSONNEL ELIMINATED (MIL / CIV) PERSONNEL REALIGNED (MIL / CIV)	0 / 28 0 / 87
ECONOMIC IMPACT (BRAC 95 / CUM)	0.1% decrease / 7.3% increase
ENVIRONMENTAL	None

Naval Undersea Warfare Center
Keyport, WA

- Test & evaluation, in-service engineeering, maintenance & repair, and industrial base support for undersea warfare systems.
- Transfer to Puget Sound Naval Shipyard of duplicative industrial workload and similar industrial functions.
- Activities within 15 miles of each other.

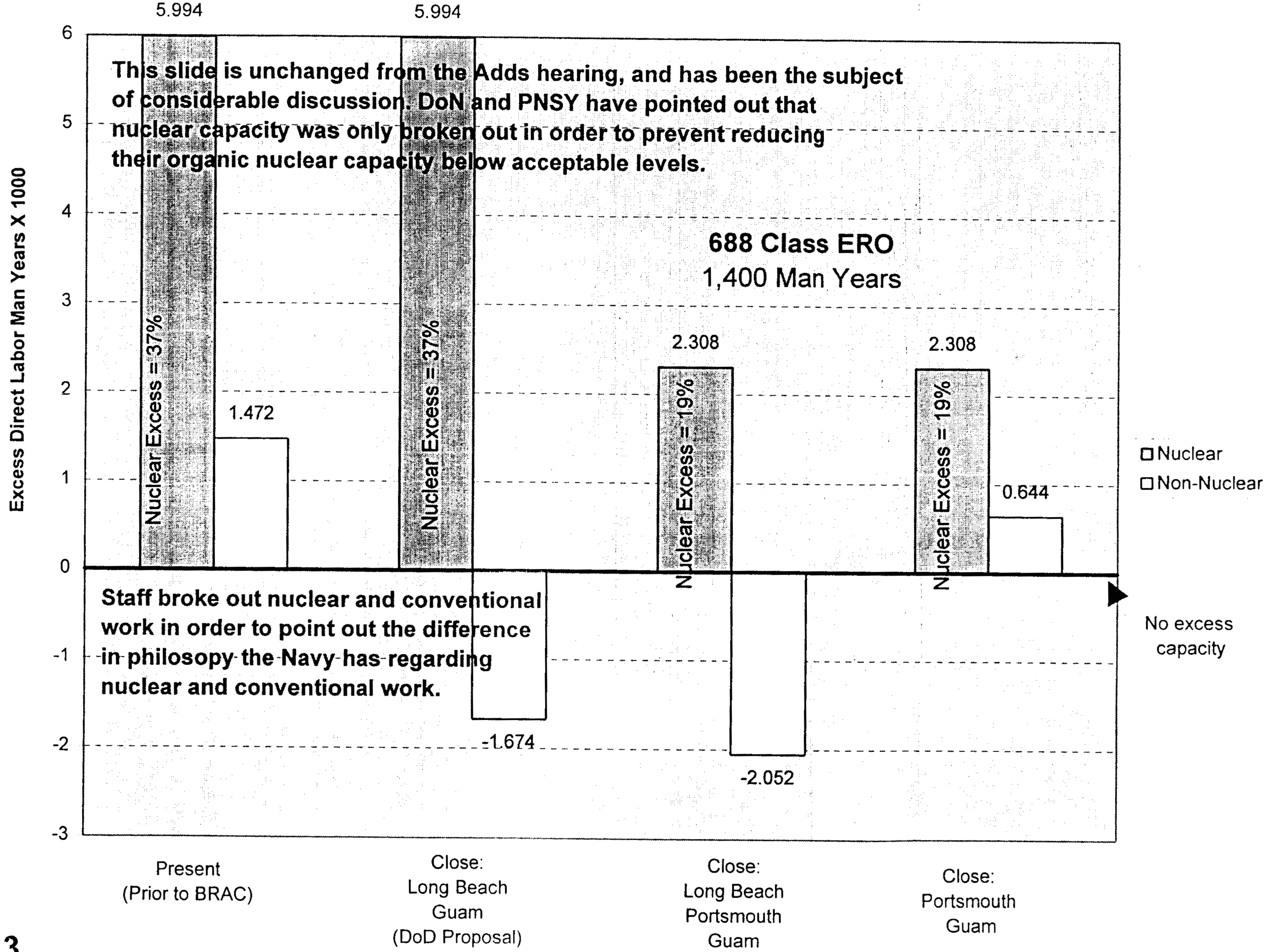
Total Excess Capacity



F-2

Excess Naval Ship Capacity FY 2001

in Various Scenarios



F-3

Capacity Measurement

- Capacity measurement based on Maximum Potential Capacity (MPC)
  - only constraint: no major MILCON
- Capacity subject to many variables - most significant is workload mix
- MPC computed using best possible mix above and beyond workload already assigned
- Workload mix changes as workload is balanced to changing priorities/budgets

B/U

NBU-28

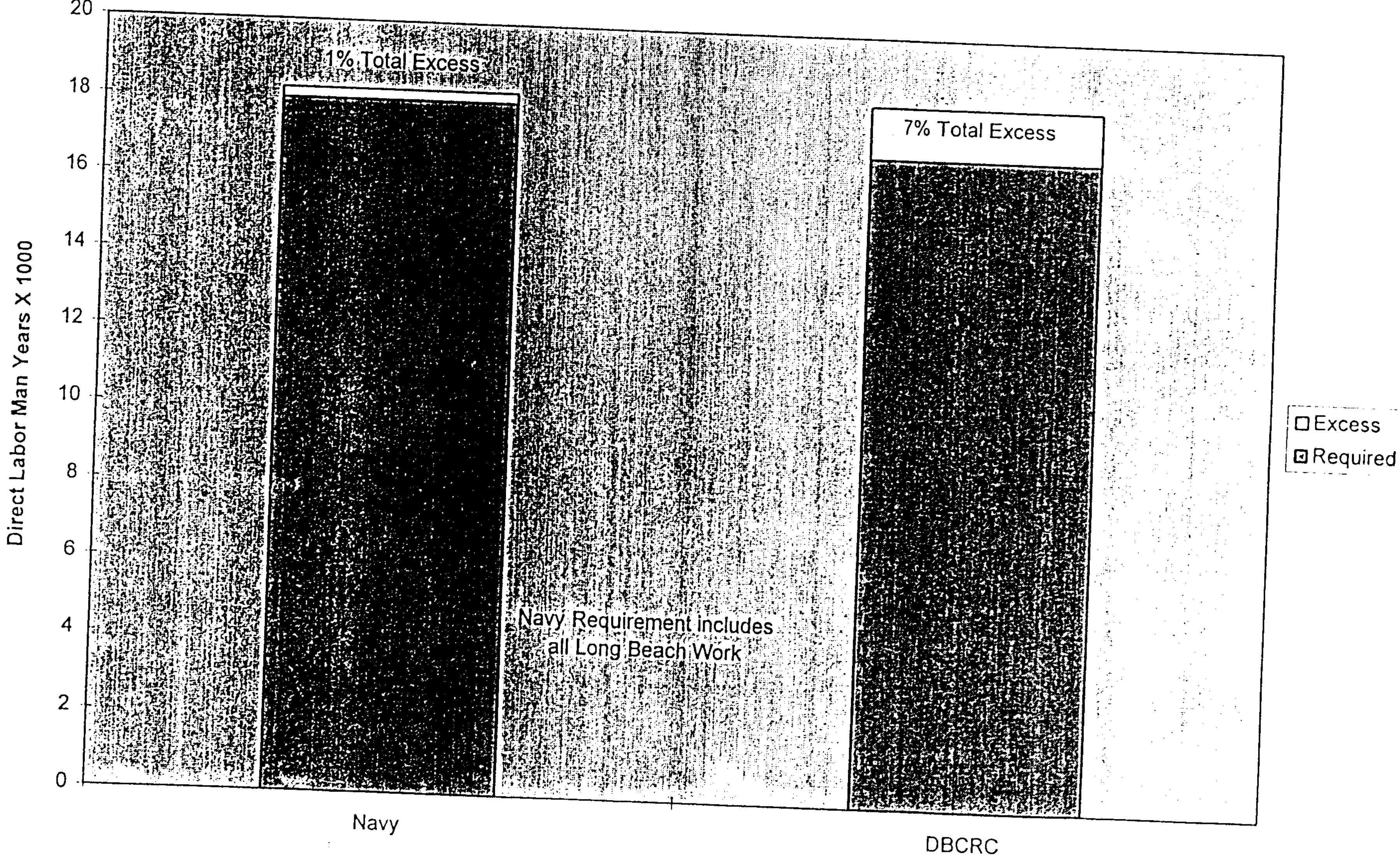
Navy Capacity

- Maximum capacity--No surplus remaining
  - projected workload remains as assigned
  - max hiring, max training, max equipment
  - no major MILCON not programmed
  - no significant increase in overhead/rates
  - must meet current commitments
- Excess Capacity = Maximum - Predicted (Scheduled)

NBU-29

B/U

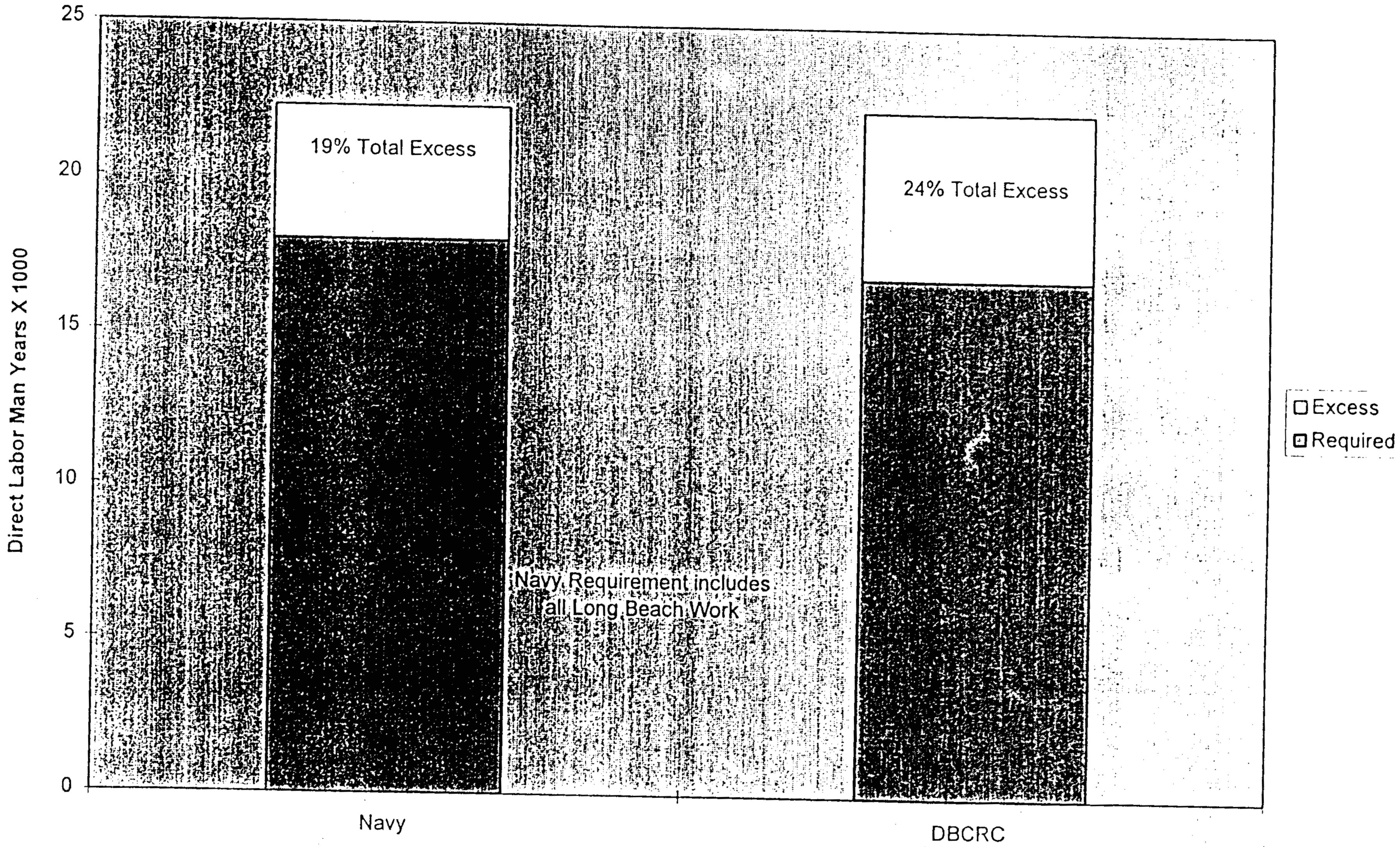
Excess Total Capacity: Long Beach, Portsmouth & Guam Close



NBU-26

B/U

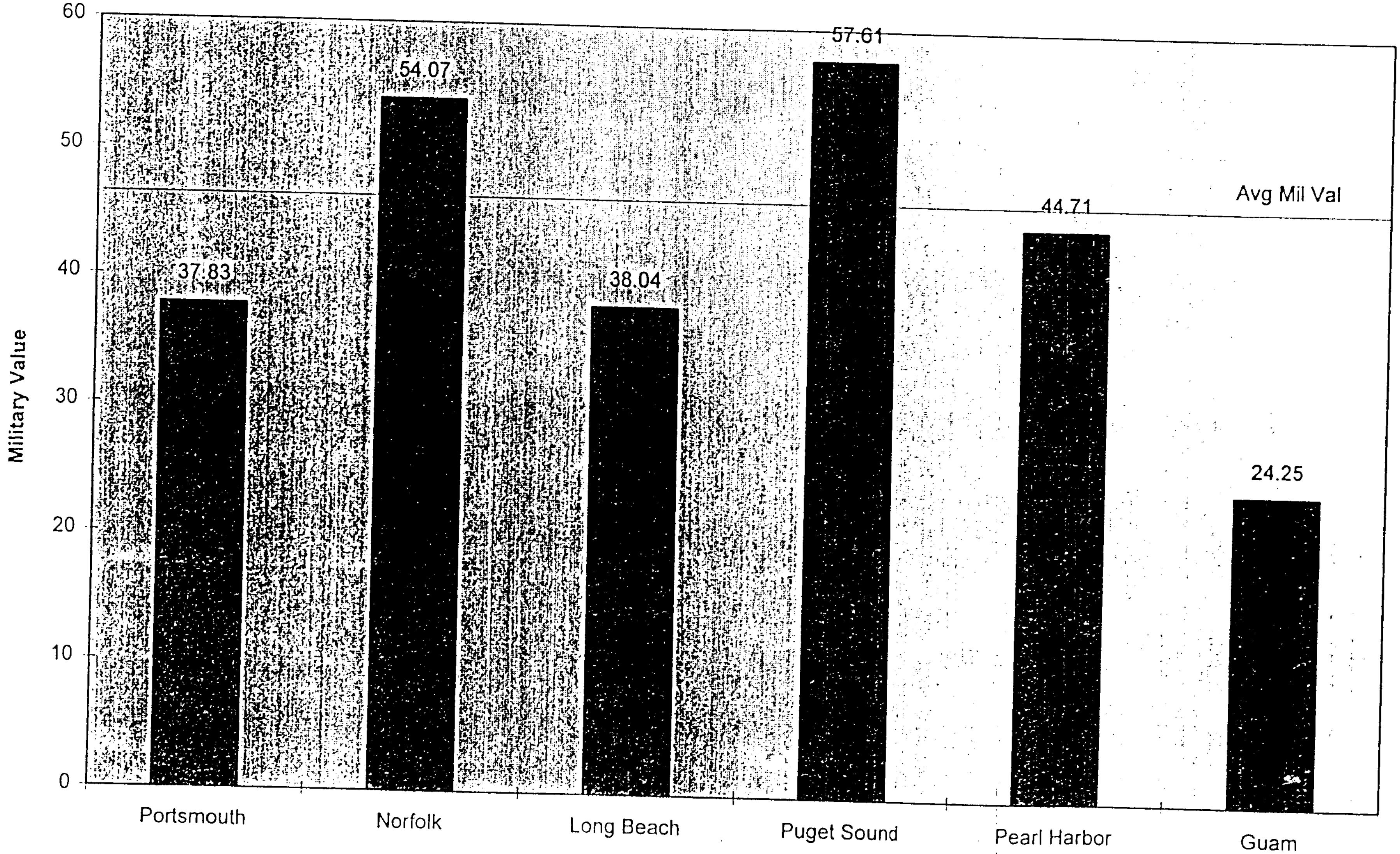
Excess Total Capacity:
Long Beach & Guam Close



NBU-27

B/0

Naval Shipyards
Military Value



NBU-24

B/U

Military Value Comparison Chart

	1993			1995		
	Total	Long Beach	Portsmouth	Total	Long Beach	Portsmouth
Drydocks	27.8	8.9	3.6	31.5	9.3	4.5
Production Workload	30.4	9.4	8.2	29.6	9.3	9.0
Costs & Manpower				14.1	4.0	6.0
Environment & Encroachment				9.2	5.2	7.0
Strategic Factors	8.1 (Location)	4.3	4.8	5.1	3.8	4.1
Crews of Customer Ships	3.5	3.5	2.8	3.3	1.6	1.6
Quality of Life	18.2	14.9	15.7	3.3	1.8	2.7
Operating Factors	11.3	6.6	5.9	3.2	2.5	2.5
Contingency	0.7	0.3	0.1	0.8	0.6	0.6
Total	100.0	47.8	41.2	100.0	38.0	37.8

NBU-25

B/U

Naval Shipyards

DOD RECOMMENDATION: Close Naval Shipyard Long Beach, CA, except retain sonar-dome GOCO and necessary housing. Workload transfers primarily to private sector.

CRITERIA	LONG BEACH, CA (C)
MILITARY VALUE	4/38.0
FORCE STRUCTURE	N/A
ONE-TIME COSTS ($ M)	74.5
ANNUAL SAVINGS ($ M)	130.6
RETURN ON INVESTMENT	1997 (Immediate)
NET PRESENT VALUE	1.95 Billion
BASE OPERATING BUDGET ($ M)	63.7
PERSONNEL ELIMINATED (MIL / CIV) PERSONNEL REALIGNED (MIL / CIV)	26 / 3,208 237 / 235
ECONOMIC IMPACT (BRAC 95 / CUM)	-0.3% / -0.4%
ENVIRONMENTAL	No Significant Issues

F-4

LONG BEACH F-4

SCENARIO	1-TIME COST	ROI YEAR	ANNUAL SAVINGS	20-YR NPV	DISCOUNT RATE
DoD Submission	$74.5M	1997 (Immediate)	$130.6M	$1.95B 1.62B	2.75% 4.85%
$358.7M shipyard closure costs added	$156.35M*	1999 (2 years)	$114.8M	$1.45B	2.75%
Closure costs increased, MDR delta eliminated	$156.35M	2000 (3 years)	$114.8M	$1.27B	2.75%
Closure costs increased, MDR delta eliminated, Discount rate increased	$156.35M		$114.8M	$992.63M	4.85%

* One-time costs do not reflect all costs to close. $203.2M O&M costs added in COBRA mission costs.

B/U

ISSUES
Long Beach Naval Shipyard

ISSUE	DoD POSITION	COMMUNITY POSITION	R&A STAFF FINDINGS
Nuclear Capacity	Nuclear work could only be performed at nuclear-capable shipyards. Conventional at either nuclear or conventional yards.	Much of the workload depicted as nuclear can be accomplished at a conventional yard.	All work classified as nuclear does not require nuclear-trained personnel, especially for nuclear surface ships, inefficiencies in breaking up work.
Nuclear and Total Excess	Though DoD computed nuclear excess capacity, it was not used in configuration analysis. Total excess is the relevant measure.	Closure of Long Beach reduces less excess capacity than any other shipyard.	DoD's calculations of nuclear and total excess did not consider private sector capacity, but implicitly relies on the private sector to absorb Long Beach work.
Carrier-Capable Drydock	Continuing decreases in force structure eliminate the need to retain the capacity to drydock large deck naval vessels for emergent requirements, beyond what is available in the private sector.	There has been no change in the numbers of large Pacific Fleet ships that require access to a large graving dock, nor is there any scheduled reduction in these ship numbers. Only Long Beach and Puget have CVN-capable dry-docks on West Coast.	There have not been, nor are there projected to be, significant changes in the numbers of large deck vessels in the Pacific Fleet. Large-decked ships can be accommodated in Puget and Pearl, although DON incurs a $20M cost to shift homeports.
Carrier Homeport	An operational issue outside of base closure. North Island homeport is most economical option. Navy estimates 388.4 homeport 3 CVNs @ NI	GAO questioned DON numbers. Community Numbers: 388.4M to homeport 3 CVNs in NI; 99.9M to homeport in LB.	Annual operating costs not fully considered. Opportunity cost to DON for closure of NAVSTA and NSY. GAO caveated estimate of 1-time costs: $343M at Long Beach.

No housing,

Long Beach Naval Shipyard
(continued)

ISSUE	DoD POSITION	COMMUNITY POSITION	R&A STAFF FINDINGS
Cost to Close	COBRA estimate $74.5M	$433.2M Shipyard Budget Submission $26M/yr. Annual Federal Employment Compensation Act (FECA) costs to DON	Cost to DoN will be higher than costs noted in COBRA.
Economic Criteria	No formal threshold established.	Navy applied inconsistent economic criteria.	-0.3% BRAC 95/-0.4% cumulative in a large metropolitan statistical area.

Long Beach Workload

Ship	FY	Yard	Mandays (000)
K. Hawk	97	Puget	120.0
Peleliu	98	Puget	213.4
Essex	99	Puget	146.3
Tarawa	00	Puget	205.5
Boxer	01	Puget	137.5

Long Beach Workload

Ship	FY	Yard	Mandays (000)
DD 967	96	San Diego	53.1
DD 986	97	San Diego	7.1
FFG 12	97	San Diego	8.7
FFG 14	97	San Diego	21.8
CG 49	98	San Diego	20.0
	00		18.4
DDG 54	00	San Diego	13.0
	01		13.0

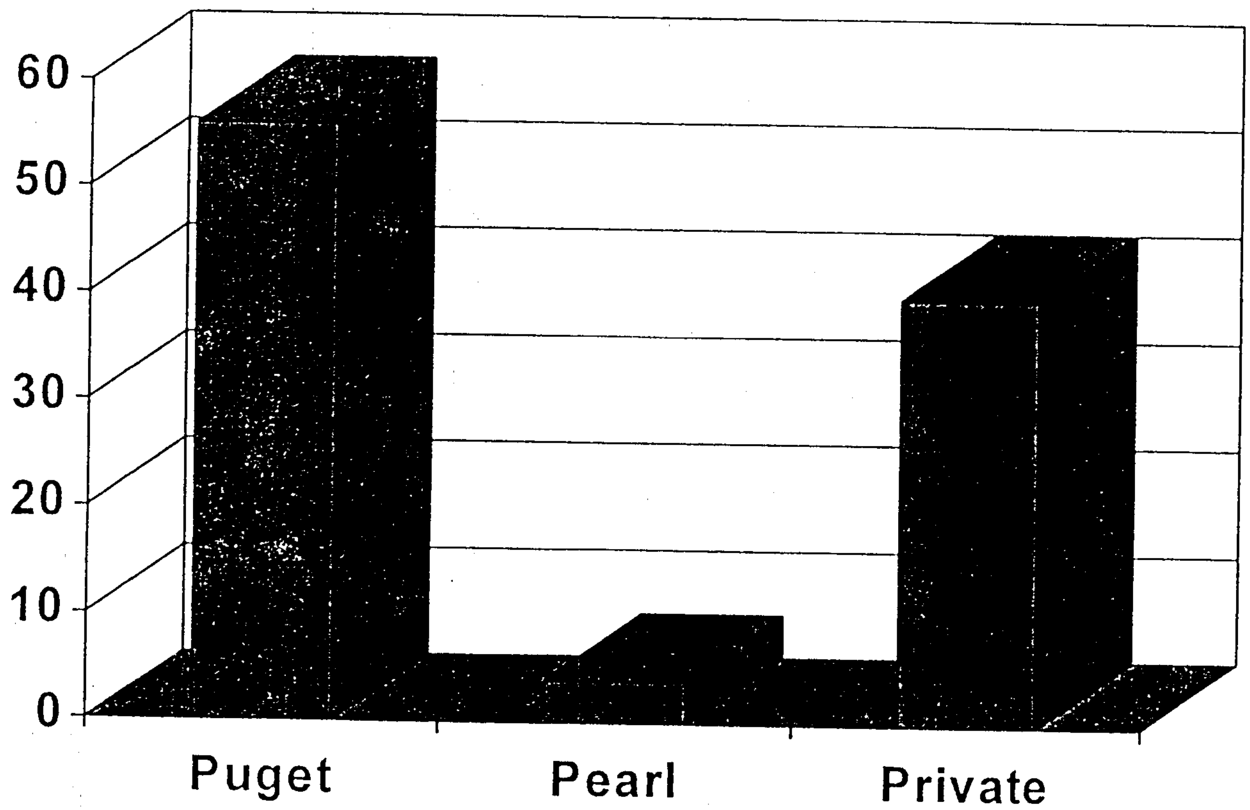
NBU-31

Long Beach Workload

Ship	**FY**	**Yard**	**Mandays** (000)
CG 57	96	San Diego	58.7
CG 62	97	San Diego	77.3
CG 63	99	San Diego	69.2
CG 59	99	San Diego	77.3
DD 972	00	TBD	44.2
AFDM 14	00	TBD	36.0
CG 54	02	TBD	68.2

NBU-32

Distribution of Long Beach Workload



NBU-33

West Coast Private Sector

- Cruiser, Destroyer, Frigate workload assumed by San Diego
- Large deck ships accommodated at Puget & Pearl
- 1991 GAO study found costs comparable, though private sector has lower rates
- San Diego drydock utilization about 80% from 1988-1994

NBU-34

According to SUPSHIP SAN DIEGO, A STUDY CONDUCTED c. 1990 INDICATED THAT THE SAN DIEGO PRIVATE SHIPYARDS COULD ACCOMODATE ~2 TIMES THE CURRENT WORKLOAD. THE SITUATION SINCE 1990 REMAINS [illegible] UNCHANGED. LBNSY WORKLOAD CAN BE ABSORBED IN SAN DIEGO [illegible] LONGER THAN [illegible] COAST-WIDE COMPETITION

Long Beach Carrier Homeporting

Long Beach

- DoN plan+FECA exceeds costs of LBNSY executing same work
- $20M cost to shift homeport for availabilities over six months
- 1991 GAO study indicates costs ~same for LBNSY and San Diego pvt sector
- Depot capabilities to be replicated at NAS NI

Navy

- FECA costs accrue to DoN regardless of LBNSY status
- $20M is an average across all homeports and should be applied to LBNSY
- Costs to DoN will be reduced because work will be performed in homeport
- RMC will reduce need for replication

NBU-35

Long Beach Carrier Homeporting

Long Beach

- Housing glut obviates necessity to build
- Glut of hospital beds precludes building; others pre-existing on shipyard

Navy

- $257M to construct Navy housing in LB
- $35M to build hospital, dental, admin, enl. dining
- Study does not address recurring operating costs

NBU-36

Carrier Homeporting: Recurring Costs

Long Beach

- $29.7M for 3 CVNs
  - Includes shore support, staffing, crew training, lost time, base operating support costs

NAS North Island

- $0.3M above current operating costs
  - Includes shore support, staffing, crew training, lost time, base operating support costs

Source: Navy study performed for GAO

NBU-37

Economic Impact
California

Activity	95 / Cumulative
FISC Oakland	0.2% / 2.6%
NWAD Corona	0.3% / 1.3%
SUPSHIP San Fran	0.0% / 0.6%
EFD San Bruno	0.0% / 0.6%
NSY Long Beach	0.3% / 0.4%

NBU-38

NBU-39

Naval Shipyard NOR
($000)

	PORTS	NORVA	LBEACH	PUGET	PEARL	TOTAL
1990	6,111	(33,351)	22,308	(26,982)	(44,961)	(76,875)
1991	(13,918)	(38,524)	20,746	(46,272)	(46,018)	(123,986)
1992	(52,189)	(33,736)	(1,351)	(117,391)	(49,275)	(253,942)
1993	(73,826)	(52,152)	596	(22,907)	(33,081)	(181,370)
1994	(57,654)	(12,527)	673	53,314	(2,701)	(18,895)

Naval Shipyard AOR
($000)

	PORTS	NORVA	LBEACH	PUGET	PEARL	TOTAL
1990	(22,111)	(82,803)	47,320	(75,850)	(99,302)	(232,746)
1991	(22,714)	(53,349)	64,632	(56,234)	(48,059)	(115,724)
1992	(81,544)	(91,813)	66,233	(213,325)	(98,134)	(418,583)
1993	(128,376)	(95,194)	2,197	(179,998)	(83,456)	(484,827)
1994	(186,030)	(108,357)	3,729	(133,935)	(86,156)	(510,749)

Naval Shipyards

COMMISSION ALTERNATIVE RECOMMENDATION: Close Naval Shipyard Portsmouth, ME.

CRITERIA	PORTSMOUTII, ME (*)
MILITARY VALUE	5/37.8
FORCE STRUCTURE	Attack submarine reductions
ONE-TIME COSTS ($ M)	100.8
ANNUAL SAVINGS ($ M)	149.9
RETURN ON INVESTMENT	1998 (Immediate)
NET PRESENT VALUE	2.3 Billion
BASE OPERATING BUDGET ($ M)	76.0
PERSONNEL ELIMINATED (MIL / CIV) PERSONNEL REALIGNED (MIL / CIV)	77 / 3,613 80 / 337
ECONOMIC IMPACT (BRAC 95 / CUM)	-5.2% / -5.2%
ENVIRONMENTAL	No Significant Issues

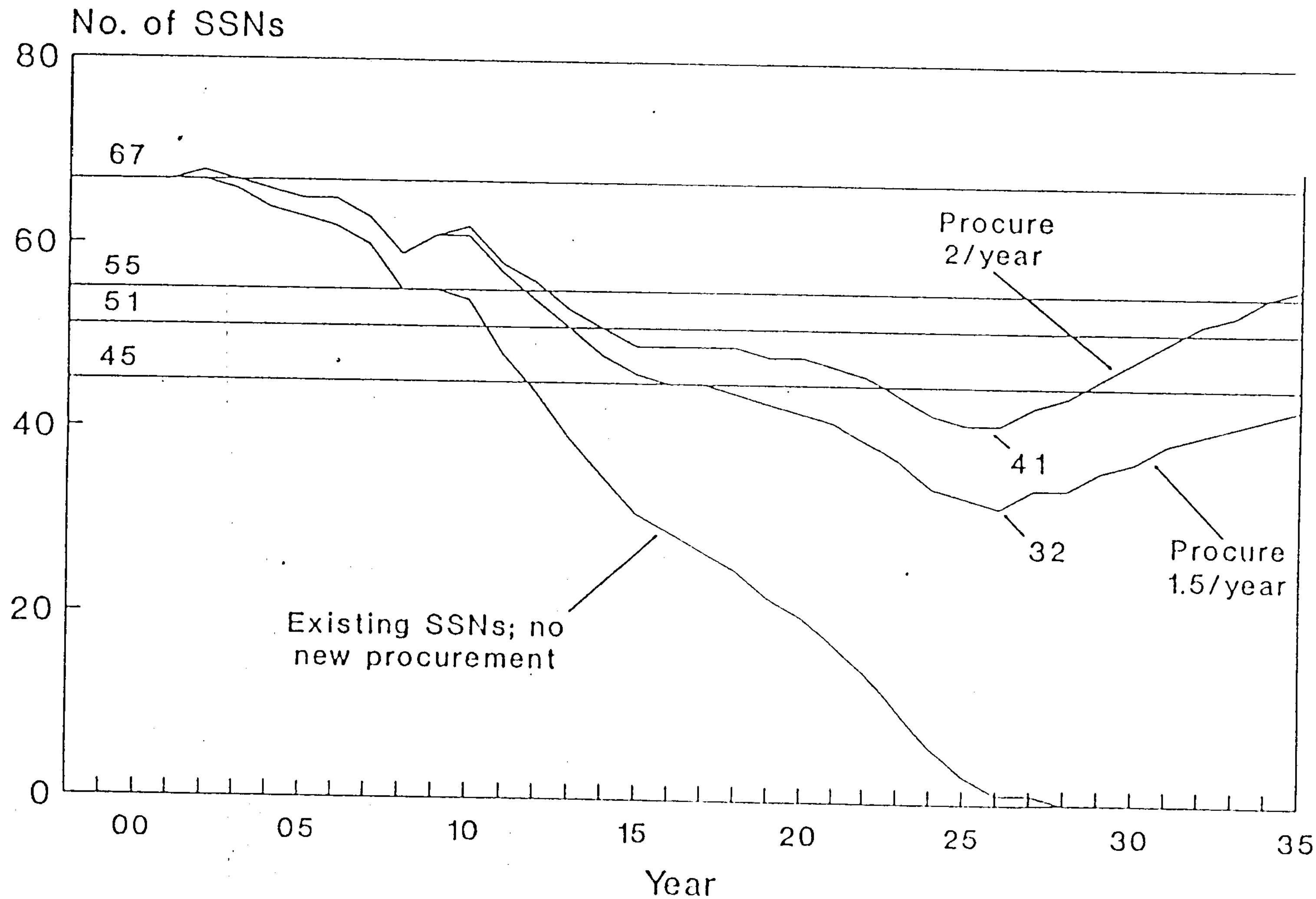
F-7

ISSUES
Portsmouth Naval Shipyard

ISSUE	DoD POSITION	COMMUNITY POSITION	R&A STAFF FINDINGS
Maximum Potential Capacity	Same process as in 1993. Validated by GAO.	Overstates sustainable capacity.	Need to examine specifics (e.g. drydock schedules).
SSN-688 Maintenance	Size & nature of future sub fleet uncertain. National & political pressures affecting introduction of replacement submarine.	Same as DoD.	Force structure plan before the Commission includes 45-55 attack submarines.
Drydock Schedules	Heel-Toe scheduling unacceptable due to high risk, notional drydock time for 688 ERO never achieved.	Same as DoD.	Drydock #3 at NORVA most likely candidate for further facilitization. 60-40 split could be violated.
Nuclear Capacity	Nuclear work could only be performed at nuclear-capable shipyards. Conventional at either nuclear or conventional yards.	Same as DoD.	All work classified as nuclear does not require nuclear-trained personnel, especially for nuclear surface ships.
Nuclear and Total Excess	Though DoD computed nuclear excess capacity, it was not used in configuration analysis. Total excess is the relevant measure.	Same as DoD.	DoD's calculations of nuclear and total excess did not consider private sector capacity.
Private Sector Capacity	Not dependable. Not responsive to tight schedules. Costs to facilitize and perform work higher.	Same as DoD.	History of refuelings in private yards. Other types of nuclear availabilities have been performed.
Cumulative Economic Impact	No position.	Loss of 4,676 direct jobs at Portsmouth combined with closings @ Bath & previous Portsmouth downsizing has cost ME & NH 32,235 jobs. Reuse in direct competition with Pease AFB.	Cumulative economic impact of 5.2%

SSN force levels

1998-2035, 30-year life



Source: Prepared by CRS, 3/95, based on U.S. Navy data.

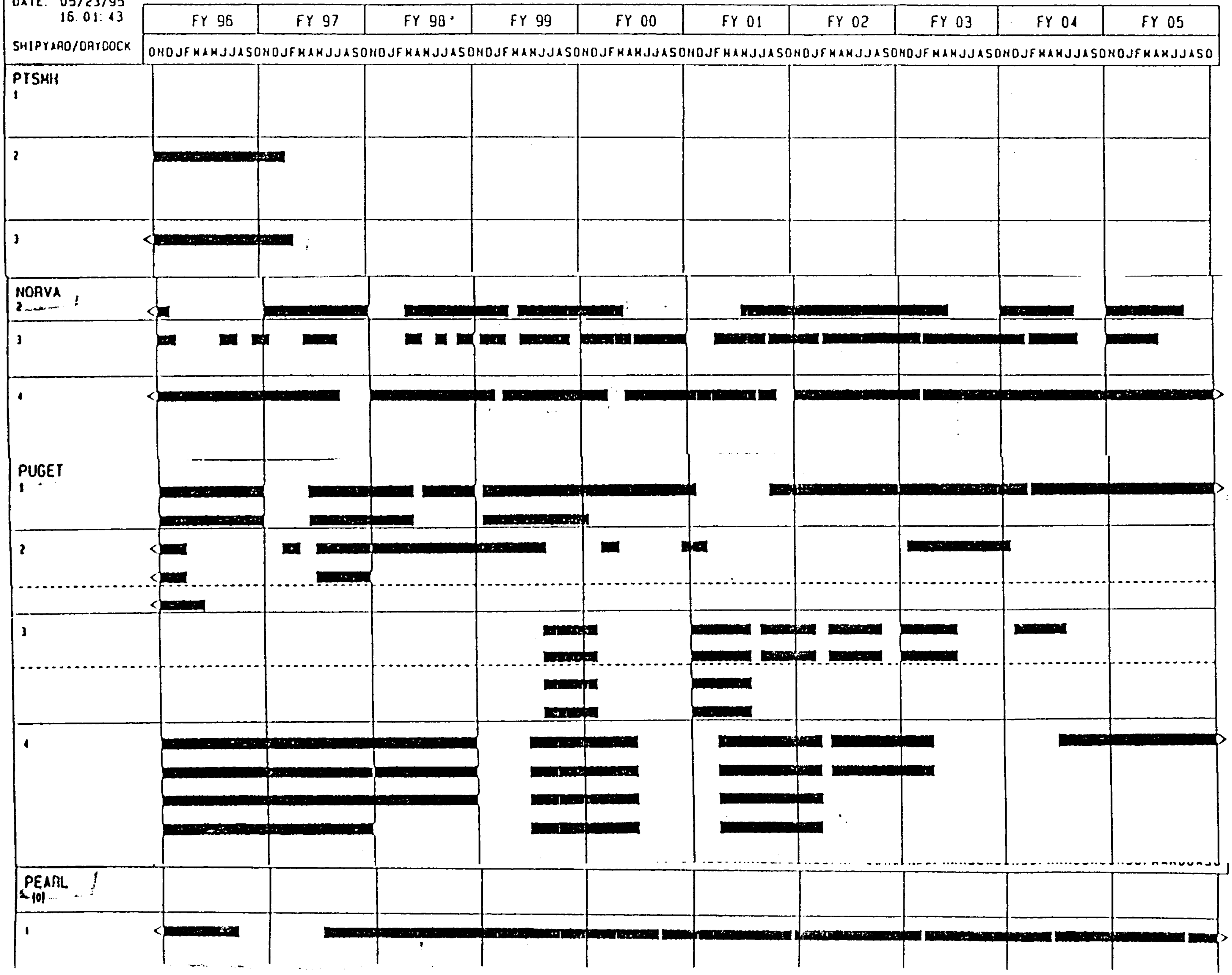
NBU-40

Yard/Dock	Nuclear Capable	688 De-fueling	688 Re-fueling	688s Re-fueled	Largest Vessel
Norfolk				Present / If PNSY Closes	
2	X	X	-		FFG-7
3	X	-	-		LPH-2
4	X	X	X	4/4	LHA/L
8	X	-	-		CVN
Puget Sound					
1	X		P	0/3	FFG
2	X	-	-		LHA/L
4	X	P	-		LHA/L
5	X	X	-		LHA/LHD
6	X	-	-		CVN
Pearl Harbor					
1	X	X	X	4/6	LHA/LHD
2	X	-	-		LHA/LHD
3					
4	X	-	-		CVN
Portsmouth					
1	X	-	-		SSN-21
2	X	X	X	6/1	DDG-51/CG-47
3	X	X	-		DDG-51

NBU-41

FOUO
REPORT: WF-550
DATE: 05/23/95
16:01:43

DRYDOCK SCHEDULE REPORT (STUDY: DC83R10)



NBV 42

SSN Refueling

- Notional duration: 20-24 months total, with 15 months in drydock
- Completed 2: USS Philadelphia & USS Los Angeles
  - completed: 27 months, 29 months
- USS Memphis: currently in ERO
  - 23 months duration
  - 17 months anticipated in drydock

NBU-43

SSN 688 Inactivations

- Notional duration: 12 months
- USS Baton Rouge completed at Mare Island
  - 17 months duration (includes wait for drydock)
  - 10 month docking period
- 2 in progress @ Portsmouth & Norfolk

NBU-44

SSN 688 Facilities & Equipment

4+ sets of refueling/defueling equipment:

- 300+ items
- 1 set at each nuclear yard
- Pearl Harbor's under construction
- 5th set in manufacture (for storage)

NBU-45

SSN 688 Facilities & Equipment

6 sets of enclosures

- 2 at Portsmouth (1 refueling, 1 defueling)
- 2 at Norfolk (1 refueling, 1 defueling*)
- 1 at Puget Sound (refueling)
- 1 at Pearl Harbor (refueling*)
- None in storage

*Under construction

NBU-46

Disposition of Mare Island and Charleston Facilities & Equipement

Being dispersed to remaining 4 nuclear yards:

- Norfolk: establishes simulaneous defueling
- Pearl: establishes ERO capability
- Portsmouth: establishes simultaneous defueling
- Puget Sound: enhances defueling capability

NBU-47

ISSUES REVIEWED
Long Beach Naval Shipyard

Nuclear Capacity Excess Total and Nuclear Capacity Carrier-Capable Drydock Carrier Homeport Cost to Close Economic Criteria Military Value	Reliability of Private-Sector Shipyards Shipyard Financial Information

NBU-48

ISSUES REVIEWED
Portsmouth Naval Shipyard

Excess Total and Nuclear Capacity	Military Value
SSN-688 Maintenance and Refueling	New Attack Submarine Procurement
Drydock Schedules	
Cumulative Economic Impact	

NBU-49

Slide F-1
Alex introduces topic and analyst.

Slide F-2
In the analysis of Naval Shipyards, capacity is an important topic. Some confusion has arisen over the capacity numbers, and I would like to clarify the issue before we proceed.

The Navy used total excess capacity in their analysis. It is represented here by the white bars. (Excess capacity is expressed in thousands direct labor man years. On this slide, the Navy requirement is represented by the zero line. From left to right, total excess capacity is depicted for the scenarios in which the shipyards listed below the bar close.)

The proposed Navy scenario in which Long Beach closes directs approximately 40% of the Long Beach workload to the private sector. This effectively reduces the Navy outyear workload requirements. The DON did not account for this, instead assuming that all of the Long Beach work was assumed by other Naval Shipyards.

R&A staff has estimated the changes to total excess capacity in those scenarios which entail closure of Long Beach. They are presented here in black.

Slide F-3
This slide is unchanged since the Adds Hearing, and has been the subject of considerable discussion. DON and the Portsmouth community have pointed out that the Navy only broke out nuclear capacity in order to prevent reducing their organic nuclear capacity below acceptable levels.

Staff broke out nuclear and conventional capacity in order to point out the difference in philosophy the Navy has regarding nuclear and conventional work.

Slide F-4
This slide presents the DOD recommendation to close Long Beach Naval Shipyard and the standard figures regarding that recommendation.

20-year COBRA savings for the shipyard are quite large. This is a reflection of the large numbers (relative to other Navy activities) of civilian employees. With shipyards, it is very difficult to come up with a closure scenario that is not supported by COBRA.

Slide F-5 and F-6
These slides represent the issues we're prepared to discuss with respect to Long Beach.

Nuclear Capacity: Read comments. Note that the Navy considers it most efficient to perform nuclear work in a nuclear-capable shipyard, but it can be and has been done elsewhere, though this is usually emergent work.

Carrier Capable Drydock: Read comments. Note that emergent nuclear work can be performed in the Drydock 1, and the dock can hold a CVN, but Navy does not schedule nuclear work to be performed there.

Carrier Homeporting: Read comments. Note that affordability of housing in Long Beach can be a problem for enlisted men.

Cost to Close: Read comments. **For R&A Findings note:** Cost to close will be higher than noted in COBRA because environmental costs are not included.

Slide F-7
This slide presents the Commission Alternative to close Portsmouth Naval Shipyard and the standard figures regarding that option.

Community has pointed out that, though the savings are attractive, they stem primarily from the elimination of personnel and facilities. Consequently, the larger the activity, the larger the savings. The community documentation indicates a 20-year NPV of approximately $1.0M.

Note: 1615 positions eliminated with no salary savings.

Slide F-8
SSN-688 Maintenance: Read comments.

Drydock Schedules: Read comments, refer to schedule NBU-42.

Private Sector: Read comments.

Cumulative Economic Impact: Read comments.

Slide F-9 & F-10
This completes the closure of Philadelphia Naval Shipyard, and will facilitate community reuse.

Slide F-11
This slide presents the standard information regarding the Supervisors of Shipbuilding, Conversion and Repair. The mission of SUPSHIPs is to oversee private shipyard work being conducted for the navy, whether it is new construction or ship maintenance. With the closure of Navy homeports in both Long Beach and the Bay Area, the SUPSHIPs in those areas have seen a considerable decrease in workload. The Navy has recommended SUPSHIP Long Beach for closure. SUPSHIP San Francisco was removed by the Secretary of the Navy for economic impact reasons, and added for consideration by the Commission on May 10th.

Address slides F-12/13.

Slide F-14 & 15
This slide presents the standard information regarding the Naval Undersea Warfare Center in Keyport, Washington. The mission of NUWC Keyport is to provide test, evaluation, in-service engineering, maintenance and industrial base support for undersea warfare systems. A substantial portion of the industrial workload at NUWC Keyport can easily be assumed by Puget Sound Naval Shipyard. Doing so will allow NUWC to consolidate its operations onto government property. (Currently, they have leased storage.) This is a win-win for both activities.

How much to enable a Navy nuke yard to do EROs?
$20-50M Facilities $25M Equipment $5M Training *$50-80M Total*

How much to facilitize a Private yard to do EROs?
EB: $50-100M for: RAEs, radiological facilities, extend RR tracks, training, equipment
NNS: $45-55M for: refueling facility conversion, training, equipment

How long to stand-up ERO capability at a Private Yard?
Estimated 3 years.

688 Refueling
20-24 mos notional duration with 15 mos in drydock

688 Refueling Schedule
FY95: none FY96: 1 at Ports FY97: none FY98: none FY99: 1 at Ports
FY00: 1 ea. Ports/NORVA FY01: 1 ea. Ports/Pearl FY02-05: 2 per year

ENTERPRISE Refueling
336 mandays assistance. 1035 mandays for specific complex job.

Shipyard 60-40 Split
FY91: 30.3% FY92: 20.2% FY93: 22.4% FY94: 32.3% FY95: 40.9%
FY96: 43.7% FY97: 59.8% FY98: 65.8% FY99: 41.2% FY00: 31.4% FY01: 37.7%

	COBRA	FY96 Budget	Environment
NSY Philly	$130M	$232	$45
NSY Charleson	$126	$156	$240
NSY Mare Island	$398	$250	$363

FY96 Budget Column excludeds environmental cleanup costs which average $216M per shipyard.

Data As Of 18:41 11/27/1994, Report Created 08:19 02/08/1995

Department : US NAVY
Option Package : NSYD PORTSMOUTH 013
Scenario File : P:\COBRA\PRELIM\PRELIM2\PNSY013.CBR
Std Fctrs File : P:\COBRA\N95DBOF.SFF

Starting Year : 1996
Final Year : 1998
ROI Year : Immediate

NPV in 2015($K):-2,323,073
1-Time Cost($K): 85,273

Net Costs ($K) Constant Dollars

	1996	1997	1998	1999	2000	2001	Total	Beyond
MilCon	498	9,507	0	-13,750	0	0	-3,744	0
Person	-230	-45,481	-105,778	-113,518	-113,518	-113,518	-492,043	-113,518
Overhd	5,525	-6,615	-21,404	-36,427	-36,427	-36,427	-131,775	-36,427
Moving	64	21,075	18,788	0	0	0	39,927	0
Missio	571	-9,680	-84,160	-88,965	-153,065	0	-335,299	0
Other	117	-2,865	-753	-5,375	0	0	-8,877	0
TOTAL	6,545	-34,060	-193,308	-258,034	-303,009	-149,944	-931,812	-149,944

	1996	1997	1998	1999	2000	2001	Total
POSITIONS ELIMINATED							
Off	1	4	41	0	0	0	46
Enl	2	0	29	0	0	0	31
Civ	6	1,901	91	0	0	0	1,998
TOT	9	1,905	161	0	0	0	2,075
POSITIONS REALIGNED							
Off	0	0	19	0	0	0	19
Enl	0	3	58	0	0	0	61
Stu	0	0	0	0	0	0	0
Civ	0	3	334	0	0	0	337
TOT	0	6	411	0	0	0	417

Summary:

CLOSES NSYD PORTSMOUTH (SEP '98) / LAST WORKLOAD OCT '97
"SUBMEPP" FUNCTIONS TO NORFOLK NSYD
1615 POSITIONS ELIMINATED / NO SALARY SAVINGS
SCENARIO 013

COBRA REALIGNMENT SUMMARY (COBRA v5.08) - Page 2/2
Data As Of 18:41 11/27/1994, Report Created 08:19 02/08/1995

Department : US NAVY
Option Package : NSYD PORTSMOUTH 013
Scenario File : P:\COBRA\PRELIM\PRELIM2\PNSY013.CBR
Std Fctrs File : P:\COBRA\N95DBOF.SFF

Costs ($K) Constant Dollars

	1996	1997	1998	1999	2000	2001	Total	Beyond
MilCon	1,070	9,507	0	0	0	0	10,577	0
Person	12	7,167	3,591	395	395	395	11,957	395
Overhd	5,568	6,701	6,412	1,573	1,573	1,573	23,400	1,573
Moving	64	21,078	18,858	0	0	0	39,999	0
Missio	571	0	0	0	0	0	571	0
Other	117	2,512	4,621	0	0	0	7,251	0
TOTAL	7,401	46,966	33,483	1,968	1,968	1,968	93,756	1,968

Savings ($K) Constant Dollars

	1996	1997	1998	1999	2000	2001	Total	Beyond
MilCon	572	0	0	13,750	0	0	14,322	0
Person	242	52,649	109,370	113,913	113,913	113,913	504,001	113,913
Overhd	43	13,316	27,817	37,999	37,999	37,999	155,175	37,999
Moving	0	3	69	0	0	0	72	0
Missio	0	9,680	84,160	88,965	153,065	0	335,870	0
Other	0	5,378	5,375	5,375	0	0	16,128	0
TOTAL	857	81,026	226,791	260,003	304,978	151,913	1,025,568	151,913

Document Separator

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON DC 20350-2000

IN REPLY REFER TO
OPNAVINST 5450.228
OP-431
Ser 00/1U500348
12 December 1991

OPNAV INSTRUCTION 5450.228

From: Chief of Naval Operations

Subj: MISSIONS OF THE NAVAL SHIPYARDS

1. Purpose. To establish the mission of the naval shipyards.

2. Cancellation. OPNAVINST 3050.22.

3. Policy. Fleet requirements are best served by a complex of naval and private shipyards. Capability and capacities of the total complex should be adequate to handle projected demands for industrial services placed on them by the fleet. Naval shipyards comprise a vital element of fleet maintenance and modernization. They are distinguished from other shore activities which render service to the fleet in that they have the industrial plant, engineering talent and artisan skills required to overhaul, drydock, repair, and modernize warships.

4. Mission. It is the mission of naval shipyards to maintain, modernize, and provide emergency repair of naval ships as directed. To accomplish this mission, it is imperative that Navy retain access to essential waterfront areas which contain unique drydock and work spaces. It is also imperative that we guarantee a competitive base for ship repair and retain a skilled work force which supports the Navy being a knowledgeable consumer of nuclear and conventional ship construction and repair services.

5. Action. Commander, Naval Sea Systems Command will promulgate implementing directives and ensure compliance with the above for activities under his command.

F. B. Kelso II

F. B. KELSO, II

Distribution:
(See next page)

0579LD0557690

Enclosure (1)

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, D.C. 20350-2000

IN REPLY REFER TO

OPNAVNOTE 4700
Ser N433F/5U594507
10 February 1995

OPNAV NOTICE 4700

From: Chief of Naval Operations

Subj: NOTIONAL INTERVALS, DURATIONS, AND REPAIR MANDAYS FOR DEPOT LEVEL MAINTENANCE AVAILABILITIES OF U. S. NAVY SHIPS

Ref: (a) OPNAVINST 4700.7J (NOTAL)
(b) OPNAVINST 3120.33B (NOTAL)
(c) OPNAVINST 4780.6C (NOTAL)

Encl: (1) Notional Intervals, Durations and Repair Mandays for Depot Level Maintenance Availabilities

1. Purpose. To issue depot level availability notional intervals, durations and repair mandays for all ships of the U.S. Navy, except those ships assigned to the Military Sealift Command.

2. Cancellation. OPNAVNOTE 4700 Ser **N433G/4U592693 of 23 Mar 94. All changes from the previous issues are shown in boldface type.**

3. Background. Reference (a) establishes the policies and responsibilities for planning, programming, budgeting, scheduling, performing, and evaluating maintenance of ships. References (b) and (c) promulgate the depot level maintenance requirements for nuclear ship and non-nuclear service craft, respectively. This notice

- **Restores the ATS 1 (OFRP) class (two ships remain in commission through FY 1995) and LST 1179 class (two ships planned for decommissioning restored to the Reserve Force)**

- **Revises SSN 637 class notional mandays per SUBMEPP analysis and LSD 41 class notional mandays per NAVSEA (PMS 335) analysis**

- **Corrects the MHC 51 and AS 31/33/36/39 class maintenance cycles to conform to the class maintenance plans**

- **Extends the maintenance cycle and revises the notional mandays for selected gas turbine ships, and**

- **Incorporates the extended maintenance cycles for SSBN 726 and SSN 688 classes.**

4. Policy. The Chief of Naval Operations requirements for the accomplishment of ship, submarine and service craft maintenance are contained in references (a) through (c).

a. U.S. Navy ships shall accomplish depot maintenance availabilities at the notional intervals, durations, and repair mandays, set forth in enclosure (1).

(1) Interval is defined as the period from the completion of one scheduled depot availability to the start of the next scheduled depot availability.

(2) Duration is defined as the period from the start of an availability to its completion.

(3) Repair Mandays are those type commander maintenance mandays typically accomplished by the executing activity to satisfactorily complete the type of availability indicated. Repair mandays include Title D and F alteration mandays normally accomplished during the availability.

(a) Submarine repair mandays are derived from Class Estimating Standards (CES).

(b) Surface ship repair mandays are derived from Maintenance Requirements Systems (MRS) estimated mandays. To facilitate stability in the programming process, enclosure (1) repair mandays are only changed to reflect those CES and MRS repair manday changes which are statistically significant.

(c) Aircraft carrier estimated repair mandays are derived from Aircraft Carrier Continuous Maintenance Program (ACCMP) for ships under the Engineered Operating Cycle (EOC) or Incremental Maintenance Program (IMP), as applicable.

b. A maintenance cycle starts after the completion of a ship's overhaul (or docking availability, when no overhaul availabilities are included in the maintenance plan) and ends after completion of the next overhaul or docking availability. For new construction or conversion ships, the maintenance cycle starts after completion of the post shakedown availability or as defined in the ship's class maintenance plan.

c. Actual durations of depot availabilities may be adjusted to accommodate necessary maintenance, modernization, and depot loading. The durations specified in enclosure (1) provide the best notional estimates for long range planning.

d. To ensure compatibility with the ship's employment schedule and to facilitate depot workloading, deviation from the notional depot availability interval, as specified in enclosure (1), is authorized as follows:

(1) Allowable deviations for submarine depot availabilities are specified in reference (b).

(2) Allowable deviations for surface ship and carrier depot availabilities are:

Period from Start of Maintenance Cycle to Start of Notional Avail	Allowable Deviation
0-36 mo	+/- 3 mo
37-48 mo	+/- 4 mo
49-60 mo	+/- 5 mo
61-72 mo	+/- 6 mo
73-84 mo	+/- 7 mo

For example, for CG 47 Class ships:

```
Duration:            2mo       3mo       2mo       8mo
          |ROH|-----|SRA|-----|DSRA|-----|SRA|------|ROH|
Notional Start 0    18mo      38mo      60mo      80mo

Allowable
Deviation       +/- 3mo   +/- 4mo   +/- 5mo   +/- 7mo
```

e. In accordance with reference (a), all depot availability schedule changes must be coordinated among cognizant Fleet Commanders-in-Chief (FLTCINCs), Commander Naval Sea Systems Command (COMNAVSEASYSCOM) and the Chief of Naval Operations (CNO N85, N865, N871, N885 and N43).

f. The mandays specified in enclosure (1) represent the "typical" mandays required by the executing activity and provide the best basis for programming and budgeting purposes. They are neither the minimum or the "cap" for ship type availabilities. Manday estimates which exceed or reduce the notional mandays for specific ship availabilities will be incorporated into the Fleet Modernization Program Management Information System (FMPMIS) data-base when technical justification is provided to CNO and COMNAVSEASYSCOM. Changes to the mandays may be required based on actual shipyard estimates or for additional services and light-off examination preparations associated with extended duration availabilities. **(As a budgeting tool for extended duration availabilities, plan an additional 8% of notional mandays for each month extension to allow for additional services and light-off exam preparations.)**

5. Action. FLTCINCs, COMNAVSEASYSCOM and OPNAV Sponsors are to implement the above guidance following the detailed policy provided in references (a) through (c).

6. Cancellation Contingency. Upon issuance of next notice.

JAMES L. TAYLOR
By direction

Distribution: (next page)

Distribution:
SNDL A1J1G (AEGIS Program Manager)
A2A (Department of the Navy Staff Offices) (NAVCOMPT, only) (2)
21A (Fleet Commanders in Chief) (N43)
22A (Fleet Commanders)
23 (Force Commanders)
24 (Type Commanders) (less 24J)
C84B (Naval Sea Systems Command Detachments) (NAVSEADET NISMF Portsmouth, VA and Bremerton, WA; PERA CV Puget Sound; PERA SURFACE Philadelphia; PERA SURFACE ATLANTIC, Norfolk, VA; and PERA SURFACE PACIFIC, San Francisco, CA)
FKA1G (Commander, Naval Sea Systems Command Headquarters (20)) (Sea 071, 072)
FKP26 (SUBMEPP Portsmouth, NH) (Code 1813) (2)
CNO (N00N, N09B18, N43 (20), N8, N80, N81, N852, N853, N865, N871, N885)

SECNAV/OPNAV DIRECTIVES CONTROL OFFICE
WASHINGTON NAVY YARD, BUILDING 200
WASHINGTON, D.C. 20374-5074 (10)

NOTIONAL DURATION, INTERVALS AND REPA. DAYS FOR DEPOT LEVEL MAINTENANCE AVAILABILITIES

SHIP CLASS	MAINT STRATEGY	TYPE AVAIL	NOTIONAL DURATION (MONTHS)	NOTIONAL INTERVAL (MONTHS)	MAINT CYCLE (MOS)	NOTIONAL MANDAYS (000S)	REMARKS TIME LINE NUMBERS INDICATE MONTHS
AD 37/41 CL	PM	DPMA PMA	4 3	60 18	64	17.3 11.5	DPMA| —| PMA| —| PMA| —| DPMA| 0 18 21 39 42 60 64
AE 26 CL	PM	DPMA PMA	4 3	51 15	55	12.5 11.3	DPMA| —| PMA| —| PMA| —| DPMA| 0 15 18 33 36 51 55
AFDB 8	ROH	SCO	6	18	24	30	SCO| —| SCO| 0 18 24
AFDL 6, 23 & 25	ROH	SCO	3	60	63	15	SCO| —| SCO| 0 60 63
AFDM CL	ROH	SCO	6	60	66	36	SCO| —| SCO| 0 60 66
AFDM 5,8	ROH	SCO	6	24	30	18	SCO| —| SCO| 0 24 30
AGF 3	EOC	ROH DSRA	10 5	115 55	125	50.0 49.1	ROH| —| DSRA| —| ROH| 0 55 60 115 125 SEE NOTE #1.
AGF 11	PM	DPMA PMA	5 3	51 15	56	24.8 15.4	DPMA| —| PMA| —| PMA| —| DPMA| 0 15 18 33 36 51 56
AGSS 555	PM	DPMA	6	18	72	UNIQUE	ROH| —| DPMA| —| DPMA| —| DPMA| 0 18 24 42 48 66 72
AO 177 CL	PM	DPMA PMA	4 3	51 15	55	13.3 8.0	DPMA| —| PMA| —| PMA| —| DPMA| 0 15 18 33 36 51 55
AOE 1 CL	PM	DPMA PMA	4 3	51 15	55	43.1 29.3	DPMA| —| PMA| —| PMA| —| DPMA| 0 15 18 33 36 51 55
AOE 6 CL	PM	DPMA PMA	4 3	51 15	55	26.3 13.6	DPMA| —| PMA| —| PMA| —| DPMA| 0 15 18 33 36 51 55

SHIP CLASS	MAINT STRATEGY	TYPE AVAIL	NOTIONAL DURATION (MONTHS)	NOTIONAL INTERVAL (MONTHS)	MAINT CYCLE (MOS)	NOTIONAL MANDAYS (000S)	REMARKS TIME LINE NUMBERS INDICATE MONTHS
AOR 1 CL	PM	DPMA	4	51	55	13.5	DPMA| —| PMA| —| PMA| —| DPMA|
		PMA	3	15		8.4	0 15 18 33 36 51 55
ARDM CL	ROH	SCO	6	60	66	50	SCO| —| SCO|
							0 60 66
ARS 50 CL	PM	DPMA	4	51	55	8.2	DPMA| —| PMA| —| PMA| —| DPMA|
		PMA	2.5	15		4.1	0 15 17.5 33.5 36 51 55
AS 31/33	PM	DPMA	4	56	60	38.4	DPMA| —| PMA| —| DPMA|
36/39 CL		PMA	3	27		25.6	0 27 30 56 60
ATS 1 CL	PROG	DSRA	3	45	48	12.5	DSRA| —| SRA| —| SRA| —| SRA| —| DSRA|
(OFRP)		SRA	2	9-12		7	0 12 14 23 25 34 36 45 48
CG 26 CL	PROG	DSRA	4	60	64	14.3	DSRA| —| SRA| —| SRA| —| DSRA|
(OFRP)		SRA	3	18		9.8	0 18 21 39 42 60 64
CG 47 CL	EOC	ROH	8	79	87	48.2	ROH| —| SRA| —| DSRA| —| SRA| —| ROH|
		DSRA	3	38		16.3	0 18 20 38 41 59 61 79 87
		SRA	2	18		10.0	
CG 47 CL	EOC	ROH	8	119	127	48.2	ROH| —| SRA 1 —| SRA 2 —| DSRA| —| SRA 3 —| SRA 4|
(EXT CYCLE)		DSRA	3	58		18.0	0 18 20 38 40 58 61 79 81 99 101
		SRA 1,3	2	18		10.0	—| ROH|
		SRA 2,4	2	18		12.0	119 127 SEE NOTE #10.
CG 47 CL	PROG	DSRA	5	51	56	38.2	DSRA| —| SRA| —| SRA| —| DSRA|
(OFRP)		SRA	3	15		27.0	0 15 18 33 36 51 56
CGN 36/38	EOC	COH	18	125	143	350	RCOH| —| SRA| —| DSRA| —| SRA| —| DSRA|
CL		RCOH	24			480	0 18 21 39 43 61 64 82 86
		DSRA	4	39		50	
		SRA	3	18		30	—| SRA| —| COH|
							104 107 125 143 SEE NOTE #2.
CV 62	PROG	DSRA	4	57	61	120	DSRA| —| ISRA| —| ISRA| —| ISRA| —| ISRA| —| DSRA|
(OFRP) See note #3.		ISRA	4	8		65	0 8 12 20 24 32 36 44 48 57 61

NOTIONAL DURATION, INTERVALS AND REP... ANDAYS FOR DEPOT LEVEL MAINTENANCE AVAILABILITIES OPNAV... 300
10 Feb 1995

SHIP CLASS	MAINT STRATEGY	TYPE AVAIL	NOTIONAL DURATION (MONTHS)	NOTIONAL INTERVAL (MONTHS)	MAINT CYCLE (MOS)	NOTIONAL MANDAYS (000S)	REMARKS TIME LINE NUMBERS INDICATE MONTHS
CV 63	EOC	COH	12	60	72	300	COH —— SRA —— SRA —— COH
& 67 CL		SRA	3	18		45	0 18 21 39 42 60 72
			-				
CVN 65	EOC	ESRA1	6	18	76.5	177	PSA —— ESRA1 —— EDSR1
		ESRA2	6	18		211	0 18 24 42 52.5
		ESRA3	6	18		244	
		EDSR1	10.5	66		311	—— ESRA2 —— ESRA2 —— EDSR2
		EDSR2	10.5	66		376	70.5 76.5 94.5 100.5 118.5 129
		EDSR3	10.5	67		434	
							—— ESRA3 —— ESRA3 —— EDSR3
							147 153 171 177 195 205.5
				NOTE: PROPOSED CONVERSION TO INCREMENTAL MAINTENANCE UNDER TECHNICAL REVIEW.			
CVN 68 CL	EOC	COH-1ST	18	84	108	650	PSA —— SRA —— DSRA —— SRA —— COH
		COH-2ND	24	84	132	950	0 18 21 39 44.5 62.5 65.5 84 108
		RCOH	32	NOTE #4		NOTE #4	
		DSRA	5.5	39		144	
		SRA	3	18		72	
CVN 68 CL	IMP	RCOH	32	NOTE #4		NOTE #4	COH —— PIA2 —— PIA2 —— DPIA3 —— PIA3 —— PIA3
(68-72)		DPIA2	10.5	66		289	0 18 24 42 48 66 76 94 100 118 134
		DPIA3	10.5	67		334	
		PIA2	6	18		162	—— DPIA3 —— PIA3 —— PIA3 —— RCOH
		PIA3	6	18		188	142 152 171 177 195 201
CVN 68 CL	IMP	RCOH	32	NOTE #4		NOTE #4	PSA/COH —— PIA1 —— PIA1 —— DPIA1 —— IA2
(73 &		DPIA1	10.5	66		239	0 18 24 42 48 66 76 94 100
LATER)		DPIA2	10.5	66		289	
		DPIA3	10.5	67		334	—— PIA2 —— DPIA2 —— PIA3 —— PIA3 —— DPIA3
		PIA1	6	18		136	118 124 142 152 171 177 195 201 219 229
		PIA2	6	18		162	
		PIA3	6	18		188	—— PIA3 —— PIA3 ——RCOH
							247 253 271 277
DD 963 CL	EOC	ROH	8	79	87	36.1	ROH —— SRA —— DSRA —— SRA —— ROH
		DSRA	3	38		12.4	0 18 20 38 41 59 61 79 87

Enclosure (1)

SHIP CLASS	MAINT STRATEGY	TYPE AVAIL.	NOTIONAL DURATION (MONTHS)	NOTIONAL INTERVAL (MONTHS)	MAINT CYCLE (MOS)	NOTIONAL MANDAYS (000S)	REMARKS TIME LINE NUMBERS INDICATE MONTHS
		SRA	2	18		7.1	SEE NOTE #5.
DD 963 CL	EOC	ROH	8	119	127	56	ROH|—| SRA|—| SRA|—| DSRA|—| SRA|—| SRA|
(EXT CYCLE)		DSRA	3	58		15.9	0 18 20 38 40 58 61 79 81 99 101
		SRA	2	18		6.7	—| ROH|
							119 127 SEE NOTE #10.
DD 963 CL	PROG	DSRA	4	49	53	21.0	DSRA|—| SRA|—| SRA|—| DSRA|
(OFRP)		SRA	2	15		13.3	0 15 17 32 34 49 53
DDG 51 CL	EOC	ROH	8	79	87	48.2	ROH|—| SRA|—| DSRA|—| SRA|—| ROH|
		DSRA	3	38		16.3	0 18 20 38 41 59 61 79 87
		SRA	2	18		10.0	
DDG 51 CL	EOC	ROH	8	119	127	48.2	ROH|—| SRA|—| SRA|—| DSRA|—| SRA|—| SRA|
(EXT CYCLE)		DSRA	3	58		16.3	0 18 20 38 40 58 61 79 81 99 101
		SRA	2	18		10.0	—| ROH|
							119 127 SEE NOTE #10.
DDG 993 CL	EOC	ROH	8	79	87	36.1	ROH|—| SRA|—| DSRA|—| SRA|—| ROH|
		DSRA	3	38		10.7	0 18 20 38 41 59 61 79 87
		SRA	2	18		7.5	
DDG 993 CL (EXT CYCLE)	EOC	ROH	8	119	127	43.5	ROH|—| SRA|—| SRA|—| DSRA|—| SRA|—| SRA|
		DSRA	3	58		16.4	0 18 20 38 40 58 61 79 81 99 101
		SRA	2	18		7.3	—| ROH|
							119 127 SEE NOTE #10.
FFG 7 CL	PROG	DSRA	3	58	61	14.9	DSRA|—| SRA|—| SRA|—| DSRA|
		SRA	2	18		8.7	0 18 20 38 40 58 61
FFG 7 (OFRP)	PROG	DSRA	3	49	52	18.9	DSRA|—| SRA|—| SRA|—| DSRA|
		SRA	2	15		12.7	0 15 17 32 34 49 52
LCC 19 (OFRP)	PROG	DSRA	5	56	61	20.3	DSRA|—| SRA|—| SRA|—| SRA|—| SRA|—| DSRA|
		SRA	4	8		10.2	0 8 12 20 24 32 36 44 48 56 61
							SEE NOTE #6.

NOTIONAL DURATION, INTERVALS AND REPA... MANDAYS FOR DEPOT LEVEL MAINTENANCE AVAILABILITIES

SHIP CLASS	MAINT STRATEGY	TYPE AVAIL	NOTIONAL DURATION (MONTHS)	NOTIONAL INTERVAL (MONTHS)	MAINT CYCLE (MOS)	NOTIONAL MANDAYS (000S)	REMARKS / TIME LINE NUMBERS INDICATE MONTHS
LCC 20	PM	DPMA	4	51	55	23.8	DPMA| —| PMA| —| PMA| —| DPMA|
		PMA	3	15		10.1	0 15 18 33 36 51 55
							SEE NOTE #6.
LHA 1 CL	EOC	COH	11	56	67	142.0	COH| —| SRA| —| SRA| —| COH|
		SRA	4	16		22.8	0 16 20 36 40 56 67
NOTE: MANDAYS MAY BE REDUCED TO 110.2 KMDYS FOR MID-LIFE COHS UPON COMPLETION OF MID-LIFE PROGRAM TECHNICAL REVIEW.							
LHA 1 CL (OFRP)	PROG	DSRA	5	51	56	80	DSRA| —| SRA| —| SRA| —| DSRA|
		SRA	3	15		47.9	0 15 18 33 36 51 56
LHD 1 CL	EOC	COH	11	56	67	135.3	COH| —| SRA| —| SRA| —| COH|
		SRA	4	16		22.3	0 16 20 36 40 56 67
LPD 4 CL	PM	DPMA	4	51	55	23.6	DPMA| —| PMA| —| PMA| —| DPMA|
		PMA	3	15.		19.7	0 15 18 33 36 51 55
LPD 4 CL (OFRP)	PROG	DSRA	4	51	55	30.7	DSRA| —| SRA| —| SRA| —| DSRA|
		SRA	3	15		23.9	0 15 18 33 36 51 55
LPH 2 CL	PM	DPMA	5	48	53	20.7	DPMA| —| PMA| —| PMA| —| DPMA|
		PMA	3	14		11.5	0 14 17 31 34 48 53
LSD 36 CL	PM	DPMA	4	51	55	25.8	DPMA| —| PMA| —| PMA| —| DPMA|
		PMA	3	15		15.1	0 15 18 33 36 51 55
LSD 41 CL	PM	DPMA	4	51	55	20.8	DPMA| —| PMA| —| PMA| —| DPMA|
		PMA	3	15		17	0 15 18 33 36 51 55
LSD 41 CL (OFRP)	PROG	DSRA	4	51	55	19.3	DSRA| —| SRA| —| SRA| —| DSRA|
		SRA	3	15		16.0	0 15 18 33 36 51 55
LST 1179 CL	PM	DPMA	4	14	54	16.3	DPMA| —| PMA| —| PMA| —| DPMA|
		PMA	3	15		14.5	0 14 17 32 35 50 54
MCM 1 CL	PM	DPMA	3	39	42	5	DPMA| —| PMA| —| DPMA|

Enclosure (1)

NOTIONAL DURATION, INTERVALS AND REPAI... ...ANDAYS FOR DEPOT LEVEL MAINTENANCE AVAILABILITIES

SHIP CLASS	MAINT STRATEGY	TYPE AVAIL	NOTIONAL DURATION (MONTHS)	NOTIONAL INTERVAL (MONTHS)	MAINT CYCLE (MOS)	NOTIONAL MANDAYS (000S)	REMARKS TIME LINE NUMBERS INDICATE MONTHS
		PMA	3	18		4	0 18 21 39 42
MCS	PM	DPMA	5	48	53	20.7	DPMA| —| PMA| —| PMA| —| DPMA|
		PMA	3	14		11.5	0 14 17 31 34 48 53
MHC 51 CL	PM	DPMA	3	38	41	3	DPMA| —| PMA| —| DPMA|
		PMA	2	18		2	0 18 20 38 41
NR-1	ROH	ROH	18	120	138	165	ROH| —| DSRA| —| DSRA| —| DSRA| —| DSRA| —| ROH|
		DSRA	2	22.5		TBD	0 22 24 47 49 71 73 96 98 120 138
							SEE NOTE #7.
SSBN 726 CL	EOC	EOH	9	168	177	83	DEL| —| EOH| —| ERO|
		ERO	24	240	264	TBD	0 168 177 240 264 SEE NOTE #8.
SSN 21 CL	EOC						MAINTENANCE CYCLE IS UNDER REVIEW.
SSN 637 CL incl SSN 671	EOC	INAC/IRR	NOTE 11	84		NOTE 11	ROH| —| DSRA| —| DSRA| —| INAC|
		DSRA	2	28		16	0 28 30 58 60 84 104
							SEE NOTE #8.
SSN 642,645	EOC	DSRA				UNIQUE	SEE NOTE #8.
SSN 688 CL (688-699)	EOC	INAC/IRR	NOTE 11	120		NOTE 11	ROH| —| DSRA1| —| DSRA1| —| ERO| —| DSRA2| —| DSRA2|
		ERO	24	120	144	310	0 38 40 78 80 110 0 38 40 78 80
		DSRA 1	2	38		22	
		DSRA 2	2	38		15	—| INAC|
							SEE NOTES #8, & 9.

Enclosure (1)

SHIP CLASS	MAINT STRATEGY	TYPE AVAIL.	NOTIONAL DURATION (MONTHS)	NOTIONAL INTERVAL (MONTHS)	MAINT CYCLE (MOS)	NOTIONAL MANDAYS (000S)	REMARKS TIME LINE NUMBERS INDICATE MONTHS
SSN 688 CL	EOC	INAC/IRR	NOTE 11	120		NOTE 11	DMP — DSRA2 — DSRA2
(700-718)		ERO	20	120	140	320	0 38 40 78 80
		DSRA 2	2	38		25	— ERO — DSRA2 — DSRA2 — INAC
							120 0 38 40 78 80 110 SEE NOTES #8, & 9.
SSN 688 CL	EOC	INAC/IRR	NOTE 11	120		NOTE 11	PSA — DSRA1 — DSRA1 — DMP — DSRA2 — DSRA2
(719-773)		EOH	15	120	135	TBD	0 38 40 78 80 120 0 38 40 78 80
		DMP	11	120	131	95	
		DSRA 1	2	38		21	— EOH — DSRA2 — DSRA2 — INAC
		DSRA 2	2	38		25	120 0 38 40 78 80 120

CHANGES/ADDITIONS TO THE PREVIOUS OPNAVNOTE 4700 ARE SHOWN IN BOLDFACE.

FLEET CODES

(OFRP) OVERSEAS FAMILY RESIDENCY PROGRAM

AVAILABILITY TYPES

- COH — COMPLEX OVERHAUL
- DEL — DELIVERY DATE
- DMP — DEPOT MODERNIZATION PERIOD
- DPIA — DOCKING PHASED INCREMENTAL AVAILABILITY
- DPMA — DRYDOCKING PHASED MAINTENANCE
- DSRA — DRYDOCKING SELECTED RESTRICTED AVAILABILITY
- EOH — ENGINEERED OVERHAUL
- ERO — ENGINEERED REFUELING OVERHAUL
- ERP — EXTENDED REFIT PERIOD
- INAC — INACTIVATION AVAILABILITY
- **IRR — COMBINED INACTIVATION, REACTOR COMPARTMENT DISPOSAL AND HULL RECYCLING AVAILABILITY**
- **ISRA — INCREMENTAL SELECTED RESTRICTED AVAILABILITY**
- PIA — PHASED INCREMENTAL AVAILABILITY

AVAILABILITY TYPES, CONTD

- PMA — PHASED MAINTENANCE AVAILABILITY
- PSA — POST SHAKEDOWN AVAILABILITY
- RCOH — REFUELING COMPLEX OVERHAUL
- RFOH — REFUELING REGULAR OVERHAUL
- ROH — REGULAR OVERHAUL
- SCO — SERVICE CRAFT OVERHAUL
- SRA — SELECTED RESTRICTED AVAILABILITY

MAINTENANCE STRATEGIES

- IMP — INCREMENTAL MAINTENANCE PLAN
- PM — PHASED MAINTENANCE
- PROG — PROGRESSIVE MAINTENANCE
- EOC — ENGINEERED OPERATING CYCLE
- ROH — REGULAR OVERHAUL

NOTES:

1. Tycom PRAVs are scheduled every 15 months between availabilities.

2. Following refueling of CGN 36/38 Class ships, the next RCOH will notionally coincide with the second scheduled COH, depending on the rate of fuel depletion.

3. ISRAs are incrementally executed over a 12 month period. Notional mandays are under review in support of the CV 62 replacement carrier.

4. For CVN Class ships, the RCOH will normally coincide with the third COH or the fourth DPIA depending on operational tempo and the actual duration of earlier depot level availabilities which directly affect the rate of fuel depletion. The Nimitz RCOH is estimated to be 2350 KMDYs. A material condition assessment is required four years in advance of an RCOH to further define manday requirements.

5. DD 963 Class VLS overhauls require 50 KMDYS and 11 months.

6. Due to operational commitments, the LCC 19 annual availability will be accomplished in two 7 or 8 week segments usually in Jun/Jul and Nov/Dec. Notional mandays are combined annual mandays. The NAVSEA (PMS 335) studies to update notional mandays for LCC 19 and LCC 20 will complete in April 1995.

7. The NAVSEA (PMS 395) study to develop notional mandays for NR-1 DSRAs will be complete in September 1995.

8. Refer to OPNAVINST 3120.33B for SSN and SSBN operating cycles, maintenance strategies and extension requirements.

9. Nuclear ships may require an adjustment in overhaul intervals depending on rate of fuel depletion. Mandays to support refueling preparations must be programmed up to 3 years in advance.

10. As agreed during August 1994 discussions held between PMS 335, PEO AEGIS, OPNAV N43, OPNAV N871, and Fleet representatives, implementation of maintenance cycles extensions for non-OFRP DD 963, DDG 51, CG 47 and DDG 993 class ships in accordance with NAVSEA ltr Ser 335L2/7299 of 29 Jul 94 (963/993 classes) and AEGIS ltr Ser 400F/565 of 2 Aug 94 (47/51 classes) will be made as follows:

CG 47 class: As of the date of this notice, the following hulls use the extended maintenance cycle: CG 47, 49, 50, 66, 67, 68, 69, 70, 71, 72, 73. The following hulls will be inducted into the extended cycle on completion of their FY 95 ROH: CG 48, 51. The following hulls will be inducted following ROH's to install hull girder stiffening modifications and/or Baseline 2 upgrades and dual-zone Impressed Current Cathodic Protection (ICCP): CG 55, 56. The following hulls will be inducted following ROH's to install hull girder stiffening modifications and/or Baseline 2 upgrades: CG 52, 53, 54, 57, 58. The following hulls will be inducted following ROH's to install hull girder stiffening modifications and/or Baseline 3 upgrades: CG 59, 60, 61, 62, 63, 64, 65.

DD 963 class: DD963 class ships will not be inducted until dual-zone Impressed Current Cathodic Protection (ICCP) is installed. DD 965 and 989 may be inducted following completion of their FY 98 DSRA if dual-zone ICCP installation is performed during that DSRA

DDG 51 class: DDG 51 class will not be inducted until after the first docking availability is performed on a ship of that class, and a material condition assessment is performed.

DDG 993 class: DDG 993 class ships will not be inducted until dual-zone Impressed Current Cathodic Protection (ICCP) is installed.

11. Notional mandays and durations of INAC/IRR availabilities are contained in the clasified portion of the OPNAV REPORT 4710.

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, DC 20350-2000

IN REPLY REFER

OPNAVINST 4700.7
N433
4 December 1992

OPNAV INSTRUCTION 4700.7J

From: Chief of Naval Operations

Subj: MAINTENANCE POLICY FOR NAVAL SHIPS

Ref:
(a) OPNAVNOTE 4700, Notional Durations, Intervals, and Repair Man-Days for Depot-Level Maintenance Availabilities of United States Navy Ships of 2 Dec 92
(b) OPNAVINST 4780.6C, Procedures for Administering Service Craft and Boats in the U.S. Navy
(c) OPNAVINST 4720.2E, Policy for Fleet Modernization Program (FMP)
(d) MIL-STD-1388, Logistics Support Analysis
(e) MIL-P-24534, Planned Maintenance System: Development of Maintenance Requirement Cards, Maintenance Index Pages, and Associated Documentation
(f) OPNAVINST 4790.4B, Ships' Maintenance and Material Management (3-M) Manual
(g) NAVSEAINST C9210.30A, Procedures for Administration o Nuclear Reactor Plant Preventive Maintenance and Tender Nuclear Support Facilities Preventive Maintenance on Ships (U)
(h) NAVSEAINST C9210.4A, Changes, Repair and Maintenance to Nuclear Powered Ships (U)
(i) NAVSEAINST 9210.14A, Changes to Submarine Tenders and Destroyer Tenders with Nuclear Support Facilities
(j) NAVSEA TM S0600-AA-PRO-010, Underwater Ship Husbandry Manual
(k) DOD Directive 4151.18, Maintenance of Military Material of 12 Aug 92
(l) SECNAVINST 4790.4, Overseas Depot Maintenance
(m) OPNAVINST 3000.13A, Personnel Tempo of Operations
(n) OPNAVINST 4423.4A, Provisioning of End Items of Material
(o) OPNAVINST 4441.12B, Retail Support of Naval Activities and Operating Forces
(p) OPNAVINST 5450.194B, Mission and Functions of the Chief of Naval Education and Training (CNET)
(q) U.S. Navy Regulations

(r) OPNAVINST 4900.79B, Intermediate Maintenance of Foreign Ships
(s) OPNAVINST 4700.8H, Trials, Acceptance, Commissioning, Fitting Out, Shakedown, and Post Shakedown Availability of U.S. Naval Ships Undergoing Construction or Conversion
(t) NAVSEAINST C9210.44A, Tenders Supporting Radioactive Work Associated with Naval Nuclear Propulsion Plants · Special Radiological Controls and Security Actions for Availabilities in Non-Nuclear Shipyards (U)
(u) OPNAVINST 3120.33B, Submarine Extended Operating Cycle (SEOC) Program
(v) OPNAVINST 4700.38, Messing and Berthing During CNO-Scheduled Availabilities
(w) SECNAVINST 3960.6, Department of the Navy Policy and Responsibilty for Test, Measurement, Monitoring, Diagnostic Equipment and Systems, and Metrology and Calibration (METCAL)

Encl: (1) Organizational-Level Maintenance
(2) Intermediate-Level Maintenance
(3) Depot-Level Maintenance
(4) Maintenance Programs
(5) Miniature/Microminiature (2M) Electronic Repair
(6) Mobile Technical Units
(7) Quality Maintenance

1. Purpose. To establish policy and responsibility for determining, authorizing, planning, scheduling, performing, and evaluating maintenance of ships, to ensure quality, safety, and operational readiness.

2. Cancellation. OPNAVINST 4700.7H.

3. Scope

a. This instruction applies to all ships of the United States Navy (active and reserve), except civilian operated ships assigned to the Military Sealift Command. Throughout this instruction, the term "ship" refers to all surface ships, aircraft carriers, submarines, and those patrol and service craft specified in reference (a). Reference (b) provides policy and guidance for maintenance of service craft and boats not addressed in reference (a).

b. The Ship Maintenance Program is one of two major components of Navy's program for maintenance and modernization of ships, which, in its entirety, defines and manages the material condition requirements and the configuration of Navy ships. The Ship Maintenance Program is designed to keep ships at the highest level of material condition practicable, and to provide reasonable assurance of their availability for operations to the Fleet Commanders. The second major component, the Fleet Modernization Program (FMP), is designed to maintain the integrity of ship configuration as changes are authorized. While the maintenance and modernization programs and budgets are distinct, the programs are closely related in their planning and execution. This instruction addresses the Ship Maintenance Program, with reference to modernization, as necessary. The Fleet Modernization Program is addressed by reference (c).

c. This instruction applies to the three echelons of maintenance: organizational-, intermediate-, and depot-level. Enclosures (1), (2), and (3), respectively, address these maintenance echelons.

4. Policy

a. Ships shall be maintained in a safe material condition, adequate to allow accomplishment of assigned missions.

b. Maintenance for new acquisition ships, systems, and equipment shall be based on Reliability-Centered Maintenance (RCM) principles in order to achieve readiness objectives in the most cost-effective manner, as outlined in reference (d). Maintenance plans for in-service ships, systems, and equipment should be reviewed and modified to incorporate RCM principles in areas where it can be determined that the expected results will be commensurate with associated costs.

c. Condition-Based Maintenance (CBM) diagnostics, inspections, and tests shall be utilized to the maximum extent practicable to determine performance and material condition of, and to schedule corrective maintenance actions for ships, systems, and equipment. CBM is based on objective evidence of actual or predictable failure of a ship's installed systems or components. This includes:

(1) Condition-directed maintenance based on objective evidence of actual or potential failure, or valid condition trend information.

(2) Adjustments to time-directed preventive maintenance such as oil changes, greasing, component software changeouts, and periodic checks based on valid engineering analysis such as the assessment of the as-found material condition of components or systems when they are disassembled for maintenance, or age-reliability analysis.

d. Maintenance actions shall be either preventive or corrective. Preventive maintenance actions shall be selected using RCM principles, which maximize the reliability of ships and minimize the total maintenance workload.

(1) Preventive maintenance actions are those actions intended to prevent or discover functional failures.

(2) Corrective maintenance actions are those actions intended to return or restore equipment to acceptable performance levels.

e. Maintenance actions shall be authorized to be performed by the lowest maintenance echelon that can ensure proper accomplishment, taking into consideration urgency, priority, capability, capacity, and cost.

(1) RCM-applicable and RCM-effective preventive maintenance actions, as defined in reference (e), shall be performed at all maintenance echelons, as authorized. Preventive maintenance for new acquisition ships, systems, and equipment shall be RCM-developed in accordance with references (d) and (e). Preventive maintenance actions for in-service ships, systems, and equipment should be reviewed and modified to incorporate RCM principles when it can be determined that the expected results will be cost effective.

(2) All organizational-level preventive maintenance actions shall be documented on Maintenance Index Pages (MIPs) in the ship's Planned Maintenance System (PMS) and managed by ship's force in accordance with the Maintenance and Material Management (3-M) system, reference (f).

(3) Nuclear reactor plant and support facilities preventive maintenance shall be administered by ship's force in accordance with reference (g).

(4) All intermediate- and depot-level preventive maintenance actions shall be documented as Master Job Catalog (MJC) items in the Maintenance Resource Management System (MRMS), or in an alternate Chief of Naval Operations (CNO) approved maintenance management system, and managed by fleet-designated subordinate activities in accordance with fleet guidelines.

(5) Preventive maintenance actions shall be:

(a) Detailed on Maintenance Requirements Cards (MRCs) for organizational-level accomplishment, and as MJC items for intermediate- and depot-level accomplishment.

(b) Scheduled in accordance with the 3-M system for organizational-level accomplishment.

(c) Scheduled in accordance with the Periodic Maintenance Requirements Scheduling Subsystem of MRMS or an alternate CNO-approved maintenance scheduling system for intermediate- and depot-level accomplishment.

(d) Accomplished as scheduled.

(6) RCM-applicable and RCM-effective corrective maintenance actions may be required to restore systems or equipment to full operation, to bring operation to within specified parameters, or to ensure safe operations.

(a) The decision to perform corrective maintenance shall be based on actual equipment condition.

(b) Safety related corrective maintenance is mandatory and shall be accomplished at the earliest opportunity.

(c) The corrective maintenance action selected (i.e., repair, replacement, or alteration) shall be based on optimizing cost and reliability considerations. Execution shall be in accordance with applicable repair or installation standards or specific technical documentation.

f. The Current Ship's Maintenance Project (CSMP) shall be the primary repository of information concerning the material condition of the ship and shall be maintained by ship's force in a complete and current status at all times.

(1) The CSMP shall be used by the ship to document all deferred preventive and corrective maintenance requirements regardless of the scurce of the requirements. These deferred items shall be validated by ship's force and entered into the CSMP in accordance with reference (f) guidelines.

(2) The CSMP shall include deferred material deficiencies reported by headquarters or fleet inspections such as Underwater Ship Husbandry Inspections, Underway Material Inspections, and Propulsion Examining Board Examinations. Where practical, deficiencies identified from these inspections should be provided to the ship in electronic format compatible with CSMP automated format to avoid imposition of laborious data entry requirements on ship's force.

g. A Maintenance Program shall be developed, within existing infrastructure, for each ship class. The Maintenance Program for each ship class shall:

(1) Be defined, for CNO (N85, N86, N87, or N88) approval, in a Maintenance Program Master Plan. The Maintenance Program Master Plan provides a general overview of the cognizant Program Executive Office's (PEO's), Direct Reporting Program Manager's (DRPM's), or Ship Program Manager's (SPM's) maintenance plan for the ship class. It specifies key elements such as: depot-level availability intervals and durations, frequency of intermediate-level availabilities, and any special maintenance, maintenance support, or infrastructure requirements.

(2) Be documented in a Class Maintenance Plan (CMP), for Commander, Naval Sea Systems Command (COMNAVSEASYSCOM) approval. For new ship classes, the CMP shall be based on logistics support analysis, reference (d). The CMP is a detailed, comprehensive document for Maintenance Program Master Plan implementation. CMPs, for in-service ship classes, should be reviewed and modified to comply with reference (d) when it can be determined that the expected results will be commensurate with associated costs.

(a) The CMP shall include all preventive maintenance actions (organizational-, intermediate-, and depot-level) with engineered periodicities. An engineered periodicity is the recommended periodicity for accomplishment of a maintenance action, and is based upon an engineering analysis of all relevant technical maintenance history information, including material condition and performance feedback data.

(b) Details concerning development and implementation of Maintenance Program Master Plans and CMPs are provided in enclosure (4).

(3) Emphasize the accomplishment of maintenance actions performed on a continuous basis throughout the ship's life cycle, using RCM and CBM principles.

(4) Emphasize assignment of maintenance actions to the lowest maintenance echelon that can ensure proper accomplishment, taking into consideration urgency, priority, capability, capacity, and cost.

(5) Provide a selection of special support alternatives (e.g., rotatable pools, insurance item management, or dedicated maintenance husbandry agents, such as Port Engineers or AEGIS Homeport Engineering Teams) whose use would be determined through the evaluation of technical and economic criteria.

(6) Minimize the time ships spend in depot maintenance by ensuring that depot maintenance availability notional intervals and durations are an integral part of both the acquisition and the life-cycle maintenance strategy for ships, and are determined by maintenance requirements, and not by anticipated modernization requirements. The installation of new alterations should be planned and scheduled to conform to these notional depot maintenance intervals and durations. Actual availability durations will be altered as necessary to accomplish all required maintenance and modernization actions.

(7) Ensure that ships and other fleet activities are as self-sufficient as practicable. The Navy should drive increasingly toward "one way of doing business" for ship maintenance, authorizing variances only where a compelling case is made and approved. Self-sufficiency shall not be interpreted as authorization or direction to independently develop and support class or ship-unique maintenance processes, or

information systems. Within the framework of this vision, maintenance programs shall utilize the following resources, enhancing self-sufficiency:

(a) Reliable on-site or on board technical decision-making support programs, such as the Miniature/Microminiature (2M) Electronic Repair Program and Mobile Technical Units (MOTUs), described in enclosures (5) and (6), respectively.

(b) Accurate technical information and data about system and equipment performance requirements, operating procedures, and maintenance and repair technical requirements and procedures. The key to this is the effectiveness of the Integrated Logistic Support (ILS) program and the manner in which that program is integrated into the larger Navy maintenance infrastructure.

(c) Effective processes and tools to minimize the labor hours required to: identify, locate, extract, and apply information and data required to perform work correctly the first time, and to accurately report work completion data. Examples are: the Advanced Technical Information System (ATIS), Maintenance Resource Management System (MRMS), Shipboard Non-tactical Auto Data Processing (SNAP) Program, Organizational Maintenance Management System (OMMS), and the Advanced Industrial Management (AIM) Program.

h. Intermediate Maintenance Activities (IMAs) are fleet assets to be utilized for accomplishment of maintenance and modernization that is beyond organizational-level capability or capacity, but not requiring depot-level assets. Intermediate-level maintenance is addressed further in enclosure (2).

i. Maintenance of ship systems and equipment shall be performed by qualified personnel using correct procedures and material in accordance with technical requirements issued by the appropriate technical authority. Policy and direction promulgated by the Fleet Commanders in Chief (FLTCINCs), COMNAVSEASYSCOM, or their subordinate activities shall comply with such technical requirements. FLTCINCs and COMNAVSEASYSCOM shall ensure procedures addressing deviations to technical requirements are established. These procedures shall:

(1) Ensure that the activity, when finding itself unable to comply with technical requirements, recommends to the

appropriate technical authority a repair which the activity considers achievable and which will ensure the needs of the fleet are satisfied.

(2) Differentiate between categories of repair, and identify, by each category of repair, the appropriate technical authority that can authorize deviation from technical requirements.

(3) Ensure work does not proceed until concurrence from appropriate technical authority is received.

(4) Ensure cognizant technical authority revises applicable technical requirements, or documents a deviation from technical requirements, to reflect resolution of the repair.

j. Depot maintenance activities perform maintenance and modernization work that is beyond intermediate-level capability or capacity. Depot-level maintenance is addressed in enclosure (3).

k. Ship configuration shall be controlled through a formal change process that provides for updating of the Ship's Configuration and Logistics Support Information System (SCLSIS) database.

l. Equipment and components installed in Navy ships shall be standardized to the maximum extent practicable to minimize life cycle logistics support costs. This means that maintenance and modernization changes, as well as new construction changes, should emphasize the use of equipment and components already supported by the Federal Supply System to the maximum extent practicable, with due consideration to life cycle cost, reliability, and maintainability.

m. Effective Integrated Logistics Support (ILS) and the resources required to implement the Maintenance Program over the life cycle of each new ship class shall be programmed and budgeted in sufficient time to ensure that support is in place by no later than the end of the lead ship's post-shakedown availability. For systems being introduced for in-service ships, ILS resources shall be programmed and budgeted to ensure support is in place coincident with fleet introduction.

n. Repairs, maintenance, and modernization of the propulsion plants in nuclear powered warships involve unique considerations for technical and quality control, ship safety, radiological controls for occupational health and safety, and information security. Accordingly:

(1) Reactor plant maintenance, repair, and modernization in nuclear powered warships, beyond the capability or capacity of the organizational level, shall be assigned only to nuclear capable shipyards or nuclear capable intermediate maintenance activities and performed following the requirements established by the Director, Naval Nuclear Propulsion (CNO (N00N), COMNAVSEASYSCOM (SEA-08)).

(2) Depot-level repair, maintenance, and modernization for steam plant systems, electric plant systems, and those auxiliary ship systems which support reactor plant and associated reactor safety systems in nuclear powered warships shall be assigned only to nuclear capable shipyards and performed per requirements established by COMNAVSEASYSCOM.

(3) Changes, repairs, and maintenance in the nuclear propulsion plants of nuclear powered warships shall be in strict accordance with reference (h).

o. Changes, repairs, and maintenance in the nuclear support facilities of nuclear capable tenders shall be in strict accordance with reference (i).

p. Drydocking shall be planned and scheduled in accordance with the ship's Maintenance Program Master Plan and Class Maintenance Plan. Underwater Ship Husbandry (UWSH) inspection, maintenance, or repair actions shall be planned and accomplished in accordance with reference (j).

(1) In the event drydocking maintenance actions are required before planned, a review of current UWSH capabilities shall be undertaken by the responsible repair activity to determine if drydocking is necessary or if emergent drydock time can be reduced cost effectively, by accomplishing repairs with qualified divers using approved procedures.

(2) Whenever feasible, UWSH maintenance actions should provide permanent repairs to avoid subsequent drydock rework costs. Where permanent repairs are not feasible, temporary

repairs shall be accomplished, within technical and cost constraints, to support ship operations until the next regularly scheduled drydocking.

q. In accordance with references (k) and (l), depot maintenance, in support of deployed weapons systems, may be performed within the theater of deployment when necessary. Depot maintenance performed overseas: must be cost effective, must not adversely impact the U.S. industrial base (public or private), and must be in compliance with existing statutes. Therefore, Navy's overseas ship maintenance policy is:

(1) Overseas homeported ships. Depot maintenance for ships being prepared for, or returning from, homeporting overseas will be scheduled to maximize the use of the industrial capacity of the United States. During the 15-month period preceeding its planned reassignment to a homeport in the United States, or a territory of the United States, only depot availabilities less than 6 months in duration may be scheduled.

(2) U.S. or U.S. territory homeported ships. In accordance with Title 10, United States Code, only voyage repair availabilities defined in subparagraph 1i of enclosure (3) may be performed on U.S. or U.S. territory homeported ships by shipyards or ship repair facilities (SRFs) located outside of the United States or its territories. For the purposes of this prohibition, a shipyard is any facility that repairs naval vessels and is located outside the United States or its territories.

r. Assignment of a specific ship availability to a public or private shipyard shall be based on complexity of work, as well as consideration of maintaining both public and private sector capability at an adequate level for Navy's current and future maintenance, modernization, and emergency ship repair requirements.

s. To comply with personnel tempo of operations (PERSTEMPO) requirements established in reference (m), CNO-scheduled private sector depot-level availablities of 6 months' duration or less shall be solicited to be accomplished in the ship's homeport area, or cluster, or as close to same as is required to ensure adequate competition, capacity, and capability.

t. To minimize negative impact on ship's force quality of life:

(1) CNO availabilities solicited coastwide, that may be awarded for out-of-homeport accomplishment, shall be planned and solicited to support contract award no less than 120 days prior to scheduled start.

(2) CNO availabilities solicited in an extended solicitation area, that may be awarded for out-of-homeport accomplishment, shall be planned and solicited to support contract award no less than 60 days prior to scheduled start.

5. Responsibilities

a. Chief of Naval Operations (CNO). The CNO is responsible for maintaining the overall readiness of naval forces. This includes the responsibility for planning and programming resources required for the acquisition, life cycle management, maintenance, and modernization of Navy ships.

(1) Director, Naval Nuclear Propulsion (CNO (N00N), COMNAVSEASYSCOM (SEA 08)). As outlined in OPNAVINST 5430.48C (NOTAL), Executive Order 12344 (statutorily prescribed by P.L. 98-525, Title 42, United States Code, Section 7158) established the responsibilities and authorities of the Director, Naval Nuclear Propulsion, CNO (N00N), who is also the Deputy Commander, Naval Sea Systems Command (SEA-08), over all facilities and activities which comprise the program, a joint Department of Energy (DOE) and Navy organization. These responsibilities and authorities include all matters pertaining to the maintenance, repair, and modification of naval nuclear propulsion plants and associated nuclear capable support facilities. Nothing in this instruction supersedes or changes these responsibilities and authorities. Accordingly, the Naval Nuclear Propulsion Directorate will be consulted in all matters pertaining to or affecting the maintenance, repair, and modification of naval nuclear propulsion plants and associated nuclear support facilities.

(2) CNO (N43), as the CNO staff (OPNAV) point of contact for all Ship Maintenance Program issues that cross Operational Forces Resource Sponsor boundaries, will:

(a) Coordinate the Ship Maintenance Program with the Operational Forces Resource Sponsors (N85, N86, N87, and N88), FLTCINCs, COMNAVSEASYSCOM, PEOs, and DRPMs, as required.

(b) Concur with all Maintenance Program Master Plans prior to approval by cognizant Operational Forces Resource Sponsors.

(c) Assess ship maintenance requirements, identify funding and other program deficiencies, and recommend resolutions to properly execute the Ship Maintenance Program.

(d) Document, via reference (a), approved Maintenance Program Master Plan depot maintenance availability notional durations, intervals, and repair man-days for all ship classes to be used for scheduling, programming, and budgeting purposes.

(e) Approve the location and dates of all CNO-scheduled depot maintenance availabilities.

(3) Operational Forces Resource Sponsors (N85, N86, N87, and N88) will:

(a) Approve all Maintenance Program Master Plans for their respective platforms and monitor compliance.

(b) Plan and program the resources required to fully support the Maintenance Program Master Plans, including: organizational-, intermediate-, and depot-level maintenance; ship acquisition; and ship disposition.

(4) The Deputy Chief of Naval Operations (Manpower and Personnel), CNO (N1), will provide trained, qualified military personnel to perform maintenance at all levels.

b. FLTCINCs. The FLTCINCs are responsible for the material condition of their assigned ships. The FLTCINCs shall:

(1) Identify and authorize required maintenance actions, using condition, cost, schedule, and mission trade-offs, as required.

(2) Ensure that ship's force, IMA, and SRF maintenance actions are planned and accomplished by qualified personnel using correct procedures and materials in accordance with cognizant technical requirements.

(3) Approve those changes to CNO-scheduled depot maintenance availabilities authorized by enclosure (3).

(4) Implement standard maintenance policies between the Atlantic and Pacific fleets.

(5) Participate in the development and implementation of each CMP.

(6) Promote self-sufficiency of fleet ships and activities.

(7) Fund ship systems Direct Fleet Support (DFS) services provided by the Naval Sea Systems Command and its subordinate activities on a cost reimbursible basis.

(8) Provide feedback of resource expenditures and as-found material condition to the 3-M System. Resource expenditure feedback is required in detail sufficient for continuous improvement of depot-level planning, programming, and budgeting. As-found material condition feedback is required in detail sufficient to support refinement and validation of technical requirements, to perform engineering analysis, and to schedule subsequent maintenance actions.

(9) Comply with additional responsibilities issued in enclosures to this instruction.

c. COMNAVSEASYSCOM. As the lead hardware systems commander for ship life cycle management, COMNAVSEASYSCOM shall:

(1) Establish Hull, Mechanical, and Electrical (HM&E) and combat systems technical requirements and provide the technical support necessary to maintain the material condition of all ships.

(2) Command the Naval Shipyards (NSYs) and Supervisors of Shipbuilding, Conversion and Repair (SUPSHIPs).

(3) Ensure that NSYs and SUPSHIPs execute ship maintenance and modernization within the scope of work authorized, employing prescribed technical and quality standards, specifications, and requirements in an efficient manner.

(4) Issue and maintain current Navy equipment drawings, technical manuals, repair standards, maintenance and test requirements, and process controls as required for ship, system, and equipment operation and maintenance.

(5) Assist and advise FLTCINCs and Type Commanders (TYCOMs) in Condition-Based Maintenance implementation.

(6) Develop RCM-based material condition diagnostic systems needed for more effective maintenance decision-making, and develop or integrate information systems required to support increased maintenance self-sufficiency of ships and other fleet activities.

(7) Manage the ship's 3-M System as specified in reference (f).

(8) Provide ship system DFS services on a cost-reimbursable basis as requested by the FLTCINCs. This support includes advice, instruction, and training of fleet personnel under the operational control of Fleet Commanders. It also includes reviews, tests, and inspections to evaluate the effectiveness and material condition of ship equipment and systems.

(9) Comply with additional responsibilities issued in enclosures to this instruction.

d. Deputy Commander, Naval Sea Systems Command (SEA-08). SEA-08, as Director, Naval Nuclear Propulsion, is responsible for all matters pertaining to the maintenance, repair, and modification of naval nuclear propulsion plants and associated nuclear capable support facilities as cited in subparagraph 5a(1).

e. PEOs, DRPMs, and SPMs. PEOs, DRPMs, and SPMs shall:

(1) Assist and advise FLTCINCs and TYCOMs in condition-based maintenance implementation.

(2) Develop RCM-based material condition diagnostic systems needed for more effective maintenance decision-making, and develop or integrate information systems required to support increased maintenance self-sufficiency of ships and other fleet activities.

(3) Issue and maintain current selected record data, ship drawings, and ship-class-specific technical manuals.

(4) Analyze in-service operational data and maintenance feedback through 3-M maintenance data, casualty reports, repair activity discrepancy reports, guarantee and warranty deficiencies and other reporting sources to determine design and process improvements and to refine maintenance requirements.

(5) Approve those changes to CNO-scheduled depot maintenance availabilities authorized by enclosure (3).

(6) Comply with additional responsibilities issued in enclosures to this instruction.

f. Other Hardware Systems Commanders (SYSCOMs). Commander, Naval Air Systems Command (COMNAVAIRSYSCOM), and Commander, Space and Naval Warfare Systems Command (COMSPAWARSYSCOM) shall:

(1) Provide NSYs, SUPSHIPs, and FLTCINCs the technical support necessary to perform quality maintenance. This support is to be coordinated with COMNAVSEASYSCOM.

(2) Analyze maintenance feedback to determine design and process improvements in order to refine maintenance requirements.

(3) Provide DFS services as requested by FLTCINCs.

(4) Comply with additional responsibilities issued in enclosures to this instruction.

g. Commander, Naval Supply Systems Command (COMNAVSUPSYSCOM). COMNAVSUPSYSCOM is responsible for procurement of material in accordance with technical specifications provided by the Hardware SYSCOMs. COMNAVSUPSYSCOM shall:

(1) Issue supply management policy and procedures as required to support material procurement and control.

(2) Determine supply allowances and requirements at all echelons of supply in accordance with references (n) and (o), which address readiness based sparing policy.

(3) Provide a system and procedures to support spare parts accountability.

(4) Ensure standard stock materials are procured and available to support intermediate and depot maintenance availability schedules.

(5) Comply with additional responsibilities issued in enclosures to this instruction.

h. Chief of Naval Personnel (CHNAVPERS). CHNAVPERS is responsible for providing trained, qualified, military personnel as specified by current manpower authorization, to perform organizational and intermediate levels of maintenance.

i. Chief of Naval Education and Training (CNET). CNET shall provide effective training in maintenance skills for military personnel in accordance with reference (p) and modify training programs to enhance quality maintenance as described in enclosure (7). RCM, CBM, and quality maintenance concepts and methods shall be included in shipboard watchstanders, equipment operators, maintainers, supervisors, planners, and engineering training programs.

STEPHEN F. LOFTUS
Deputy Chief of Naval
Operations (Logistics)

Distribution:
(see next page)

Distribution:

SNDL	A2A	(Department of the Navy Staff Offices) (NAVCOMPT, only) (2)
	A5	(Chief of Naval Personnel) (2)
	21A	(Fleet Commanders in Chief)
	22A	(Fleet Commanders)
	23	(Force Commanders)
	24	(Type Commanders) (less 24J)
	26A	(Amphibious Group)
	26F	(Operational Test and Evaluation Force and Detachment)
	26H	(Fleet Training Group)
	26S	(Mobile Technical Units)
	26Z	(Shore Intermediate Maintenance Activity)
	26MM	(Fleet Integrated Logistics Overhaul Team)
	28	(Squadron, Division and Group Commanders - Ships)
	29	(Warships)
	30	(Mine Warfare Ships)
	31	(Amphibious Warfare Ships)
	32	(Auxiliary Ships)
	36	(Service Craft)
	41A	(Commander Military Sealift Command)
	41B	(Area Commanders, MSC) (3)
	C25A	(OPNAV Support Activity Detachment) (Ft. Ritchie, only)
	C81	(COMSPAWARSYSCOM Shore Based Detachments)
	C84B	(Naval Sea Systems Command Detachments) (NAVSEADET NISMF Portsmouth, VA and Bremerton; PERA CV Puget Sound; PERA SURFACE Philadelphia; PERA SURFACE ATLANTIC, Norfolk, VA; PERA SURFACE PACIFIC, San Francisco, CA, only)
	FA13	(Submarine Support Facility LANT)
	FB13	(Submarine Base PAC)
	FB30	(Ship Repair Facility)
	FC5	(Support Activity NAVEUR)
	FF8	(Inspection and Survey Board)
	FF42	(Scol Postgraduate)
	FKA1B	(Space and Naval Warfare Systems Command) (10)
	FKA1F	(Supply Systems Command) (10)
	FKA1G	(Sea Systems Command) (175)
	FKM9	(Supply Center)
	FKM13	(Ships Parts Control Center) (6)
	FKM17	(Fleet Material Support Office) (7)
	FKM19	(Publications and Printing Service)
	FKP1N	(Warfare Assessment Center)
	FKP26	(SUBMEPP Portsmouth, NH)

Distribution: (Cont'd)
SNDL FKP4E (Surface Warfare Center and Divisions (Port Hueneme and Dahlgren, only))
FKP5A (Sea Support Center) (10)
FKP16 (Ship Systems Engineering Station)
FKP7 (Shipyard) (10)
FKP8 (Supervisor of Shipbuilding, Conversion and Repair USN) (3)
FKP9 (Shipbuilding Liaison Office)
FKP10 (Sea Systems Command Management Office)
FKP16 (Ship Systems Engineering Station)
FKQ3 (Electronic Systems Engineering Center and Activity)
FKR6A (Air Warfare Center Aircraft Divisions (Lakehurst, only))
FS1 (Intelligence Command Headquarters (Code 21)) (2)
FT1 (Chief of Naval Education and Training)
FT43 (Surface Warfare Offficers School Command) (5)
FT88 (Engineering Duty Officer School)

N's: 00N, 17E, 095, 953, 04C, 40, 41, 43 (50), 08, 85, 86, 865, 866 (3), 87, 871 (2), 88, and 885

AEGIS PROG MGR
Department of the Navy
Washington DC 20362-5102

SECNAV/OPNAV Directives
Control Office
Washington Yard
Building 200 1st Floor
Washington DC 20374-5074 (30 copies)

Stocked:
Naval Aviation Supply Office
Physical Distribution Division, Code 103
5801 Tabor Avenue
Philadelphia, PA 19120-5099 (100 copies)

ORGANIZATIONAL-LEVEL MAINTENANCE

1. Definition. Organizational-level maintenance is the lowest maintenance echelon and consists of all maintenance actions within the capability of ship's force.

2. Policy

a. Organizational-level maintenance may be assigned to higher maintenance echelons if beyond the capacity of ship's force.

b. Typical organizational-level maintenance actions include, but are not limited to, such items as:

(1) Facilities maintenance, such as cleaning and preservation.

(2) Routine systems and component preventive maintenance, such as inspections, systems operability tests and diagnostics, lubrication, calibration, and cleaning.

(3) Corrective maintenance, such as hull, mechanical, electrical, and electronic troubleshooting down to the lowest replaceable unit level, miniature and microminiature (2M) electronic repair, and minor repairs to components to restore operation.

(4) Assistance to higher level maintenance activities.

(5) Verification and quality assurance of maintenance accomplished by other activities.

(6) Documentation of all deferred and completed maintenance actions, whether accomplished by ship's force or by other activities.

3. Responsibilities

a. The Ship's Commanding Officer. The ship's commanding officer is responsible for the proper preservation, repair, maintenance, and operation of his or her ship, in accordance with article 0834 of reference (q), and for cost effective management of required maintenance actions. The ship's commanding officer shall:

(1) Ensure ship's force accomplishment of organizational-level maintenance actions.

(2) Ensure that quality maintenance is performed by other activities by providing assistance and oversight, as necessary, to ensure that published quality assurance standards are adhered to.

(3) Document all maintenance actions in accordance with reference (f), whether accomplished by ship's force or by other activities.

(4) Ensure the Current Ship's Maintenance Project (CSMP) is maintained in a complete and up-to-date status.

INTERMEDIATE-LEVEL MAINTENANCE

1. Definition

a. Intermediate-level maintenance is normally accomplished by Navy Intermediate Maintenance Activity (IMA) personnel on or at tenders, repair ships, aircraft carriers, Aircraft Intermediate Maintenance Departments (AIMDs), submarine refit and support facilities (e.g., Trident Refit Facilities (TRFs), Naval Submarine Support Facility New London, and Submarine Base Pearl Harbor), Shore IMAs (SIMAs), and Naval Reserve IMA Maintenance Facilities (SIMA NRMFs). Within the limits of each IMA's personnel (numbers, skills, and levels of training) and facilities (shops, docks, machinery, and diagnostics equipment), IMAs perform those maintenance, repair, overhaul, installation, quality assurance, calibration, testing, and related functions on hull, mechanical, and electrical (HM&E), and combat equipments and systems which are beyond the capability or capacity of the customer. This definition applies specifically to those intermediate-level maintenance functions required to support ships. IMAs are Fleet Commander in Chief (FLTCINC) assets.

b. Intermediate Maintenance Availability (IMAV). An IMAV is an IMA availability for the accomplishment of maintenance and alterations. IMAVs may be scheduled or emergent, and may be further categorized based on scope, location, and type. During these availabilities, the ship may be rendered incapable of fully performing its assigned mission and tasks due to the nature of the repair work. IMAVs are assigned by the FLTCINC or his authorized representative.

2. Mission

a. IMAs (Afloat and Ashore). IMAs:

(1) Perform intermediate-level maintenance and provide related support to ships.

(2) Provide in-rate training and experience for enlisted ratings who repair and maintain shipboard systems. These trained personnel enhance fleet readiness and ship self-sufficiency.

(3) Provide in-rate training and experience for assigned Selected Reserve units.

b. Repair Ships and Tenders (ADs, ARs, ASs). In addition to subparagraph 2a, repair ships and tenders, because of their mobility, also:

(1) Provide capability for repair of battle damage and other emergent repairs to forward deployed operating forces, when required.

(2) Provide redeployment capability between theaters to complement the movement of operating forces.

c. Shore Intermediate Maintenance Activities (SIMAs). In addition to subparagraph 2a, SIMAs also:

(1) Provide meaningful assignments ashore in support of the sea/shore rotation that is required to retain the skilled personnel needed for sea duty.

(2) Provide a mobilization option for wartime maintenance and battle damage repair.

(3) Provide billets co-located with Naval Reserve Force (NRF) ships to support Training and Administration of Reserve (TAR) personnel sea/shore rotation and retention.

(4) During peacetime, train Selected Reserve (SELRES) personnel assigned to billets on Type III NRF frigates in ship maintenance functions. This training is to enhance and maintain individual rating proficiency. Upon mobilization, these SELRES shall report to their assigned ships.

3. Policy

a. In keeping with the policy of performing maintenance at the lowest level that can assure proper accomplishment, IMAs should be utilized to the maximum extent practicable. All IMAs are authorized, within the limits of capability and capacity, to perform work that is classified as organizational-level, but is not feasible or practicable for ship's force to accomplish because of time or personnel constraints.

b. Work that is within IMA capability but in excess of local IMA capacity may be assigned to the private sector industrial base under the Commercial Industrial Services (CIS) program or to an appropriate depot activity.

c. To increase operational availability, IMAVs may be assigned concurrent with CNO-scheduled depot availabilities. In these instances, a formal agreement between the IMA and the cognizant Naval Shipyard, or Supervisor of Shipbuilding, specifying responsibilities, should be obtained.

d. Intermediate-level maintenance is to be executed on a continuous basis, as well as during dedicated IMAVs.

e. Authorized work includes, but is not limited to the following:

(1) Preventive maintenance.

(2) Corrective maintenance.

(3) Tests and inspections.

(4) Provision of services such as electrical power, water, gas and air replenishment, and tool issue.

(5) Installation of alterations.

(6) Work on electronic miniature/microminiature printed circuit boards, components, modules, subassemblies, and other equipment coded for intermediate-level repair.

(7) Calibration and repair services for electrical and electronic test and monitoring equipment; pressure, vacuum, and temperature measuring devices; and mechanical measuring instruments.

(8) Technical assistance to ship's force in diagnosing system or equipment problems and assistance in repairs, as necessary.

(9) Assistance in the emergency repair and manufacture of unavailable replacement parts or assemblies.

f. Work on equipment held in storage as rotational assets (e.g., missiles, torpedoes) shall be accountable to the item's Life Cycle Manager and not to the activity storing or testing the equipment.

g. IMAs shall use either the Logistic Data System (LDS) or the Maintenance Resource Management System (MRMS) for identification, assignment, and tracking of work items, schedules, and resources.

h. IMAs may perform work on foreign ships if authorized by CNO (N43). In accordance with reference (r), foreign ship repair work that would either interfere with future planned work or would restrict an afloat IMA from meeting its readiness requirement for getting underway shall not be undertaken.

4. Responsibilities

a. Chief of Naval Operations (CNO).

(1) CNO (N43) will establish general policy and guidance concerning accomplishment of intermediate-level maintenance.

(2) CNO Operational Forces Resource Sponsors (N85, N86, N87, and N88) will establish the number of afloat and ashore IMAs required in support of fleet needs.

b. FLTCINCs. FLTCINCs shall:

(1) Plan and schedule IMAVs.

(2) Determine IMA manpower and funding requirements for the preparation of budgets.

(3) Manage resources allocated for intermediate-level maintenance.

c. The Commander, Naval Sea Systems Command (COMNAVSEASYSCOM). COMNAVSEASYSCOM shall:

(1) Provide technical support to IMAs.

(2) With FLTCINC assistance, define and maintain IMA baseline capability descriptions. As a minimum, the baseline

will describe, by IMA type: work center functions, billets, industrial plant equipment, and maintenance responsibilities.

d. Commander, Naval Reserve Force (COMNAVRESFOR). COMMNAVRESFOR shall coordinate efforts with the FLTCINCs to optimize the productivity and contribution of the Selected Reserve to the fleet's maintenance requirements.

DEPOT-LEVEL MAINTENANCE

1. Definition. Depot-level maintenance is that maintenance which requires skills or facilities beyond those of the organizational and intermediate levels and is performed by naval shipyards, private shipyards, naval ship repair facilities, or item depot activities. Approved alterations and modifications which update and improve the ship's military and technical capabilities are also accomplished. The following depot availabilities are defined:

a. Overhaul. A major availability, normally exceeding 6 months' duration, for the accomplishment of maintenance and modernization. Program Managers frequently use terms such as:

(1) Regular, complex, or engineered overhaul availability (ROH, COH, or EOH) to describe or identify planning and execution differences among overhaul availabilities of different ship classes.

(2) Refueling, refueling complex, or engineered refueling overhaul availability (RFOH, RCOH, or ERO) to describe or identify fundamental planning and execution differences among overhaul availabilities of different nuclear powered ship classes, during which the reactor is also refueled.

b. Depot Modernization Period (DMP). An availability scheduled primarily for the installation of major, high priority warfare improvement alterations.

c. Selected Restricted Availability (SRA). A short, labor-intensive industrial period assigned to ships in Progressive or Engineered Operating Cycle Maintenance Programs, for the accomplishment of maintenance and selected modernization. Ships assigned to Progressive Maintenance Programs are maintained through SRAs in lieu of overhauls.

d. Docking Selected Restricted Availabilities (DSRA). An SRA expanded in scope to include maintenance and modernization that require drydocking.

e. Phased Maintenance Availability (PMA). A short, labor-intensive availability for ships in a Phased Maintenance Program for the accomplishment of maintenance and modernization. Ships assigned to Phased Maintenance Programs are maintained through PMAs in lieu of overhauls.

f. Docking Phased Maintenance Availability (DPMA). A PMA expanded in scope to include maintenance and modernization that require drydocking.

g. Restricted Availability (RAV). An availability assigned to an industrial activity for the accomplishment of specific items of work while the ship is present and rendered incapable of fully performing its assigned missions and tasks.

h. Technical Availability (TAV). An availability for the accomplishment of specific items of work by an industrial activity, during which the ship's ability to fully perform its assigned mission and tasks is not affected.

i. Voyage Repair (VR) Availability. An availability solely for the accomplishment of corrective maintenance of mission- or safety-essential items necessary for a ship to deploy or to continue on its deployment. Repairs accomplished during a VR availability are frequently referred to as voyage repairs.

j. Fitting-Out Availability (FOA). An availability assigned to newly built, activated, or converted ships at the shipyard designated as the fitting-out activity to place on board the material specified in the ship's allowance lists. Reference (s) provides guidance on the procedures, scheduling, and durations of these availabilities.

k. Post Shakedown Availability (PSA). An availability assigned to newly built, activated, or converted ships upon completion of post-delivery shakedown. PSAs will be scheduled so that they are completed no later than the end of the Shipbuilding and Conversion, Navy (SCN) obligation work limiting date, which is the date on which SCN funding and work authority terminates. Work performed shall normally include correction of defects noted during shakedown, correction of deficiencies remaining from the acceptance trials, and performance of class modifications remaining from the new construction, activation, or conversion period. Reference (s) provides guidance on the procedures, scheduling, and durations of these availabilities.

l. Inactivation Availability. An availability assigned to prepare a ship for inactivation or disposal. The scope of work depends on the planned disposition of the ship.

m. Activation Availability. An availability assigned to return a ship to active status.

n. Service Craft Depot Availability (SCDA). A major industrial availability for the accomplishment of maintenance and modernization on service craft.

2. Policy

a. Every ship completing a CNO-scheduled depot availability shall be capable of carrying out its mission with a reasonable expectation of maintaining a satisfactory condition of readiness until the next CNO-scheduled depot availability.

b. All depot availabilities shall be accomplished at the lowest practical cost, and work performed shall adhere to published maintenance and repair technical requirements and standards.

c. Maintenance and repair work essential for safe and reliable nuclear propulsion plant operations and submarine submerged operations will not be deferred from one depot-level maintenance period to the next.

d. CNO-scheduled depot availabilities shall be scheduled in accordance with reference (a) guidelines.

e. Maximum adherence to the reference (a) notional schedule is essential to minimize degradation of a ship's material condition and to ensure orderly workload planning at depot-level maintenance activities. In the event it becomes necessary to revise planned availability schedules, the procedures outlined in subparagraph 3c shall be followed.

f. Commencement of Maintenance Cycle. Maintenance cycles shall commence on the first day of the month after completion of

PSA, or as indicated in the Class Maintenance Plan (CMP), or as indicated in reference (a) for that ship class.

g. Priority of Work in Naval Shipyards (NSYs). Work shall be accomplished in NSYs in accordance with the following priorities, listed in descending order:

(1) Work associated with the Trident program.

(2) Voyage repairs.

(3) Work on ships being prepared for deployment.

(4) CNO-scheduled depot maintenance availabilities.

(5) RAV/TAV availabilities.

(6) Other U.S. Navy ship availabilities, except for inactivation or disposal.

(7) Refurbishment of repairables.

(8) Work on other U.S. Government ships.

(9) Inactivation and disposal availabilities.

(10) Work on foreign ships.

h. Reactor plant maintenance, repair, and modernization in nuclear powered warships, beyond the capability or capacity of the organizational level, shall be assigned only to nuclear capable shipyards or nuclear capable intermediate maintenance activities and performed following the requirements established by the Director, Naval Nuclear Propulsion (CNO (N00N), COMNAVSEASYSCOM (SEA-08)).

i. Depot-level repair, maintenance, and modernization for steam plant systems, electric plant systems, and those auxiliary ship systems which support reactor plant and associated reactor safety systems in nuclear powered warships shall be assigned only to nuclear capable shipyards and performed per the requirements established by COMNAVSEASYSCOM.

j. Availabilities of tenders with nuclear support facilities may be assigned to non-nuclear capable shipyards, provided the requirements of reference (t) are met.

k. Availabilities awarded in the private sector shall be accomplished in such a manner to ensure quality performance, promote vigorous and healthy competition, support the nation's industrial base, and include quality of life considerations for ship's force.

l. Since condition-directed repair renders full definition of all work prior to the start of the availability impractical, availability contracts must have the flexibility to add and delete work, during availability execution, without placing the government at a negotiating disadvantage.

3. Procedures

a. Availability Assignment and Scheduling.

(1) CNO (N43) will:

(a) Coordinate among OPNAV staff, fleet, COMNAVSEASYSCOM, and Program Executive Offices (PEOs) or Direct Reporting Program Managers (DRPMs), as required, the assignment and scheduling of all CNO-scheduled depot availabilities.

(b) Maintain the approved CNO Depot Maintenance Schedule (OPNAVREPORT 4710), as a file, in the Fleet Modernization Program Management Information System (FMPMIS) database.

(2) The CNO Operational Forces Resource Sponsors (N85, N86, N87, and N88) will determine the fiscal year that activation and inactivation availabilities are to be scheduled.

(3) The FLTCINC, or his designated representative, shall:

(a) Assign and schedule RAVs, TAVs, and VR availabilities.

(b) Recommend changes to, or approve as authorized in subparagraph 3c, changes to CNO-scheduled depot availabilities.

(4) PEOs, DRPMs, and Ship Program Managers (SPMs) shall recommend changes to, or approve as authorized in subparagraph 3c, changes to CNO-scheduled depot availabilities.

b. <u>CNO-scheduled Depot Maintenance Availabilities</u>. Ships shall generally undergo CNO-scheduled depot maintenance availabilities at the intervals and durations set forth in reference (a).

(1) <u>Maintenance Cycle</u>

(a) Allowable deviations from submarine maintenance cycles are specified in reference (u).

(b) Allowable deviations from surface ship maintenance cycles are specified in reference (a).

(c) For deviations that exceed references (a) or (u) guidelines, fleet shall provide COMNAVSEASYSCOM an assessment of the ship's material condition. COMNAVSEASYSCOM shall provide fleet impact of proposed deviations. Reasons for these deviations along with any impact identified shall be included on the fleet's schedule change request.

(2) <u>Durations</u>. Reference (a) availability durations are to be used as nominal durations in long-range planning. After the scope of the work package is defined at the Work Definition Conference (WDC), it is incumbent upon the accomplishing activity to evaluate the work package and assess its capacity and capability to perform the work in the allotted time. Recommended adjustments to availability durations should be officially addressed during WDC, or as soon as possible thereafter.

c. <u>Schedule Changes</u>. Changes to CNO-scheduled availabilities may become necessary for operational or other reasons. However, such changes must be held to an absolute minimum in order to maintain to the maximum extent practical the Ship Maintenance and Modernization Program integrity. Maintaining schedules will avoid workload disruption and the associated additional costs. In the event it becomes necessary to revise the schedules, the following procedures shall be followed:

(1) FLTCINCs are authorized to approve changes to overhaul availabilities, SRAs, DSRAs, PMAs, DPMAs, DMPs, and SCDAs provided they:

(a) Do not change accomplishing activity or fiscal year of execution.

(b) Do not constitute a major workload adjustment.

(c) Do not extend the availability duration by greater than 35 days from the currently approved duration.

(d) Do not deviate from the maintenance cycle beyond the allowable deviations specified in references (a) and (u).

(e) Are coordinated with COMNAVSEASYSCOM, the PEO or DRPM, and the accomplishing activity, and reported to CNO (N43) and the cognizant Operational Forces Resource Sponsor.

(2) TYCOMs, or other designated subordinate activities, may be authorized by the FLTCINC, in writing, to approve changes authorized in subparagraph 3c(1) provided the changes also:

(a) Do not alter the availability start date by greater than 35 days.

(b) Do not alter the completion date by greater than 35 days beyond the CNO-completion date established at the commencement of the availability.

(c) Are reported to the FLTCINC.

(3) PEOs, DRPMs, and SPMs are authorized to approve changes to FOAs, PSAs, activation, or inactivation availabilities provided they:

(a) Do not change accomplishing activity or fiscal year of execution.

(b) Do not constitute a major workload adjustment.

(c) Are coordinated with fleet, COMNAVSEASYSCOM, and the accomplishing activity, and reported to CNO (N43) and the cognizant Operational Forces Resource Sponsor.

(4) Changes not authorized in subparagraphs 3c(1) through 3c(3) shall be referred to CNO (N43) for approval.

(5) Issuance of changes to the CNO Depot Maintenance Schedule, and recommendations for changes, normally are accomplished by naval message. The FMPMIS OPNAVREPORT 4710 database is the official Department of Navy (DON) ship depot maintenance scheduling database and will be kept updated to reflect all approved schedule changes.

(6) FLTCINC, COMNAVSEASYSCOM, PEO, or DRPM schedule changes and change requests shall be addressed to: CNO (N43), the cognizant CNO Operational Forces Resource Sponsor (N85, N86, N87, or N88), and CNO (N00N) for nuclear powered ships and tenders with nuclear support facilities, with an information copy to: the cognizant COMNAVSEASYSCOM codes; PEO, DRPM, or SPM; planning yard; SUPSHIP or NSY; and other interested activities.

(7) Activities executing availabilities which will extend beyond the current CNO-approved completion date must formally propose a new completion date in sufficient time to obtain approval of the request prior to the expiration of the currently CNO-approved completion date.

(8) Schedule change requests for "out-year" availabilities may be deferred for resolution at the Fleet Depot Maintenance Scheduling Conferences. For purposes of this instruction, out-year availabilities are defined as those beyond the current budget years, or beyond the budget years being submitted during the current fiscal year. For example, FY 1996 and beyond are considered out-years during FY 1992 and FY 1993.

d. Solicitation of Private Sector Availabilities. Private sector availabilities will be solicited, competed, and awarded using the Federal Acquisition Regulation (FAR) and the Defense Federal Acquisition Regulation Supplement (DFARS).

e. Public/Private Competition (PPC) Program

(1) The Public/Private Competition (PPC) Program was initiated by Congress on a test basis in 1985. The goal of the PPC program is to improve efficiency and reduce costs in both the public and private sectors.

(2) Recommendations for availabilities to be included in the PPC program shall be forwarded to CNO (N43). These recommendations will be coordinated among COMNAVSEASYSCOM, fleet, and OPNAV staff via CNO (N43), and forwarded to Assistant Secretary of the Navy for Research, Development and Acquisition, ASN (RD&A), for approval in time to permit an orderly solicitation and award process. Appendix A to enclosure (3) outlines the typical PPC candidate selection process. Consideration shall be given to minimize the negative impact on personnel tempo of operations (PERSTEMPO) and other quality of life issues.

(3) PPC availabilities shall be solicited, competed, and awarded using established procurement and Naval Comptroller (NAVCOMPT) guidelines. Appendix B to enclosure (3) outlines the typical PPC solicitation and award process.

(4) COMNAVSEASYSCOM shall assign an Administrative Project Officer (APO) to all PPC availabilities to fairly assess compensation for changes and to represent customer interests in specified areas.

4. Responsibilities

a. CNO

(1) CNO Operational Forces Resource Sponsors (N85, N86, N87, and N88) will:

(a) Approve Maintenance Program Master Plans for their respective platforms, including Naval Reserve Force (NRF) ships and those patrol and service craft listed in reference (a).

(b) Monitor Maintenance Program Master Plan compliance.

(c) Review all CNO-scheduled depot availability changes with CNO (N43) prior to approval.

(2) CNO (N43) will:

(a) Document, in reference (a), the notional depot availability durations, intervals, and repair man-days approved by the Operational Forces Resource Sponsors, for each ship class.

(b) Control schedules for CNO-scheduled availabilities in accordance with paragraph 3.

(c) Coordinate all depot maintenance schedule changes with: the cognizant Operational Forces Resource Sponsors, COMNAVSEASYSCOM, the cognizant PEOs or DRPMs, and for nuclear powered ships or ships with nuclear support facilities, the Director, Naval Nuclear Propulsion (CNO (N00N)).

b. <u>FLTCINCs</u>. FLTCINCs shall:

(1) Maintain the depot maintenance intervals and cycles issued in reference (a) to the maximum extent practical within operational requirements.

(2) Plan for and monitor availability execution to achieve a balance of cost and schedule for the scope of work authorized. Ensure that any growth in the scope of work authorized is necessary to reasonably assure safe, reliable operation of the ship during the subsequent operating cycle.

(3) Inform the Chief of Naval Personnel (CHNAVPERS (N1)) of any significant changes which would affect ship manning requirements during an extended depot availability.

(4) Ensure that testing of all systems and equipment installed or repaired during the availability, which require at-sea testing, is conducted prior to availability completion.

(5) Coordinate with the PEO, DRPM, or SPM, as applicable, in the accomplishment of depot availability planning.

(6) Implement docking officer qualification and certification requirements as issued in COMNAVSEASYSCOM instructions.

(7) Plan for and provide berthing, messing, offices, classrooms, equipment stowage space, and ship's force repair shop

space in accordance with reference (v), when shipboard facilities are expected to become unusable or uninhabitable. This pertains to all private shipyard availabilities and all public shipyard availabilities when the public shipyard is unable to provide adequate facilities.

(8) Assign and schedule RAV, TAV, and VR availabilities. This may be delegated to subordinate commands for accomplishment.

(9) Ensure completion data for SRF availabilities is forwarded to COMNAVSEASYSCOM for analysis and refinement of maintenance requirements.

(10) Approve changes to CNO-scheduled availabilities authorized in paragraph 3.

c. COMNAVSEASYSCOM. COMNAVSEASYSCOM shall:

(1) Establish Naval Shipyard (NSY) operating policies.

(2) Furnish timely information on the prospective workloads of NSYs and SUPSHIPs to the respective FLTCINCs for their guidance, recommending changes to scheduled availabilities to balance workload and avoid excessive cost to Navy.

(3) Establish performance standards for the accomplishment of maintenance, modernization, and all other shipwork scheduled for accomplishment by depot-level maintenance activities.

(4) Ensure that NSYs and SUPSHIPs execute ship repair and modernization within the scope of work authorized, employing prescribed technical methods, specifications, and quality assurance requirements in the most cost efficient manner.

(5) Coordinate the development of methods and products for depot-level maintenance planning and execution which make use of advanced digital information systems and technology, such as Technical Information Files (TIFs) currently being developed under the Advanced Industrial Management (AIM) Program.

(6) Establish minimum requirements for qualification and certification of docking officers for floating drydocks, graving docks, and marine railways.

(7) Ensure that management information systems used for the collection and analysis of post-availability completion and as-found condition data are compatible with the 3-M system.

(8) Conduct system and equipment engineering analysis to eliminate or refine maintenance periodicities.

(9) Assist PEOs or DRPMs and FLTCINCs or TYCOMs in coordinating private-sector, CNO-scheduled, depot availability assignment and contracting within established FAR and DFARS guidelines.

(10) Assist FLTCINCs in the design, acquisition, and technical support of SRFs.

d. PEOs, DRPMs, and SPMs. PEOs, DRPMs, and SPMs shall:

(1) Issue availability planning milestones that maximize the probability of successful execution, and:

(a) If the availability is solicited for accomplishment in a coastwide area, support a contract award no less than 120 days before the CNO-scheduled availability start date.

(b) If the availability is solicited for accomplishment in an extended solicitation area, support a contract award no less than 60 days before the CNO-scheduled availability start date.

(c) If the availability is to be conducted within a ship's homeport area, support a contract award no less than 30 days before the CNO-scheduled availability start date.

(d) If unable to comply with (a) through (c), above, alternative contract options must be formally reviewed with the fleet, and forwarded to CNO (N43) for resolution, if required.

(2) If unable to award availabilities detailed in subparagraph 4d(1)(a) at least 90 days prior to the CNO-scheduled availability start date, notify CNO (N43).

(3) Conduct a post-overhaul evaluation and review with the Fleet or Type Commander within 60 days of an overhaul availability completion.

(4) Analyze post-availability completion data, and refine maintenance requirements data for FLTCINC and CNO (N85, N86, N87, N88, and N43) use.

(5) Ensure system and equipment engineering analysis is conducted to eliminate or refine maintenance periodicities.

(6) Coordinate with the FLTCINCs or TYCOMs all private-sector, CNO-scheduled, depot availability assignment and contracting within established FAR and DFARS guidelines.

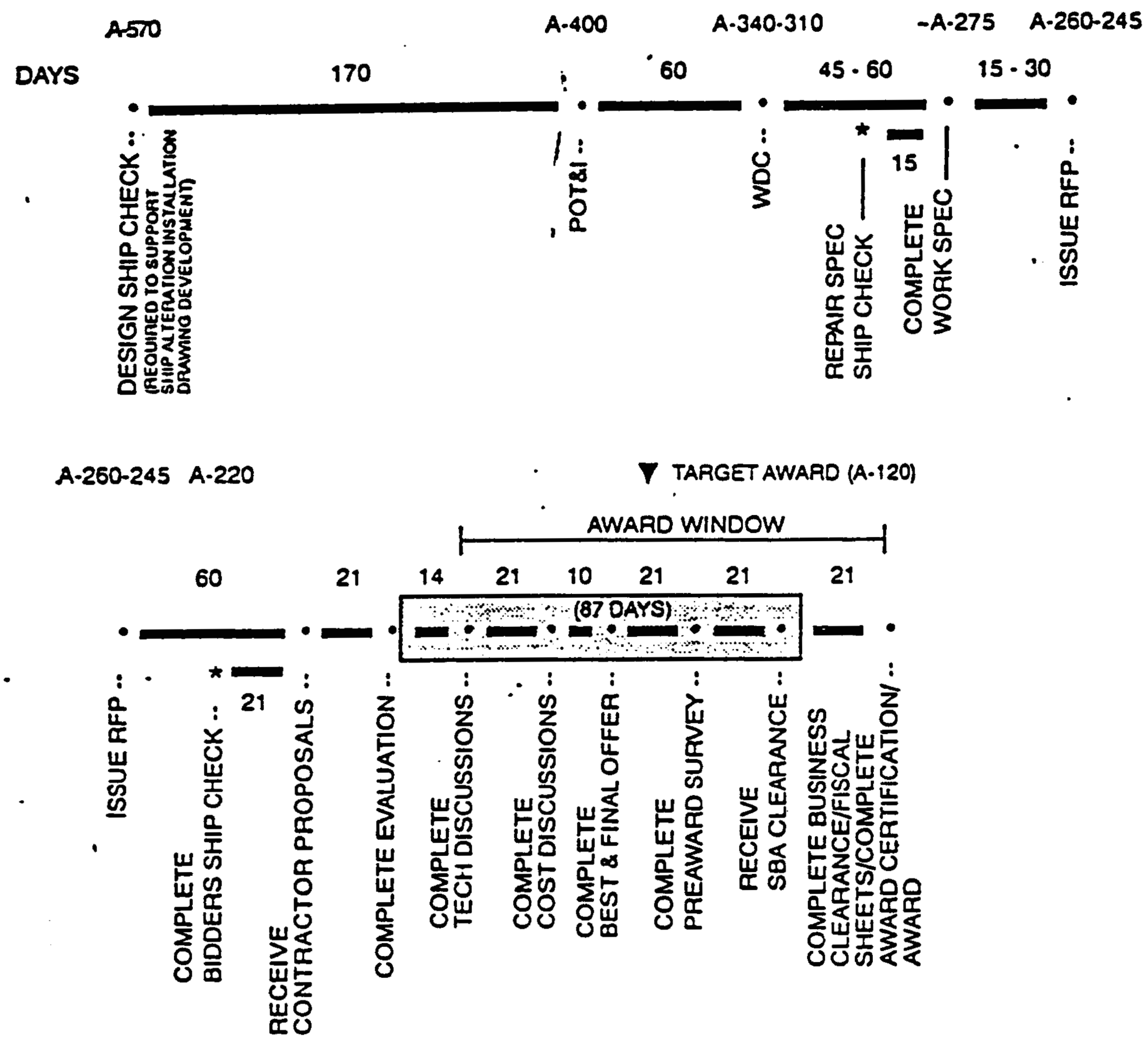
(7) Conduct a combined alteration and repair verification conference with the fleet at least 8 months prior to an overhaul availability start.

(8) Approve changes to CNO-scheduled availabilities authorized in paragraph 3.

TYPICAL PPC SELECTION PROCESS

ACTION	COG	TIME
• ESTABLISH/REVISE PPC GUIDANCE FOR THE NEXT 3 FISCAL YEARS (E.G., FY 94, 95 & 96)	ASN(RD&A)	NOV
• PROPOSE CHANGES TO FY94, 95 PPC PROGRAM AND RECOMMEND CANDIDATES FOR FY96 PROGRAM	NAVSEA 07	JAN
• ESTABLISH DEPOT MAINTENANCE PROGRAM INCLUDING PPC, NAVAL SHIPYARD, AND PRIVATE SECTOR WORKLOAD	FLT, NAVSEA,CNO (at Depot Maint Sched Conf)	APR
• REVIEW MAINTENANCE PROGRAM. RESOLVE MAJOR NAVAL SHIPYARD WORKLOAD AND PPC ISSUES	CNO (N43), SEA 07,91,92, CPF, CLF	SCHED CONF + 2 WEEKS
• FORWARD DEPOT MAINTENANCE PROGRAM PPC AND EXECUTION ACTIVITY CHANGES TO ASN(RD&A) FOR APPROVAL	CNO (N43)	MAY (1 Week)
• SECNAV APPROVE SHIP DEPOT MAINTENANCE PROGRAM PPC AND EXECUTION ACTIVITY CHANGES	ASN(RD&A)	MAY (1 Week)
• UPDATE FMPMIS WITH APPROVED PPC CANDIDATES FOR EXECUTION YR +2; EXECUTION YR +3 FOR PLANNING ONLY	CNO (N43)	MAY
• PUBLISH NEW OPNAVREPORT 4710	CNO (N43)	MAY

TYPICAL
SURFACE SHIP ROH PLANNING/CONTRACTING TIMELINE, (PPC)



NOTE: SCHEDULE SHOWN ASSUMES NO PROTESTS FILED

* IF SHIP NOT AVAILABLE FOR THESE EVOLUTIONS. EXPECT DELAY

☐ IF REQUIRED

MAINTENANCE PROGRAMS

1. Maintenance Program Definition

a. The goal of Navy Ship Maintenance is to maintain adequate ship material condition and availability for operations (readiness). The Maintenance Program established for a class of ships is the structure for defining and using RCM-based applicable and effective maintenance elements in a predetermined manner to maintain or restore ship material condition at the level needed to achieve the required degree of readiness. These elements include personnel, material, facilities (public and private), programs, and procedures. The overall goal is successful determination of maintenance requirements and authorization of applicable and effective maintenance actions at the lowest practical cost.

b. The Navy ship is a unique entity in that responsibility for both the operation and maintenance of the ship rests with the ship itself. Other Navy organizations exist to support that entity.

c. By focusing on engineering requirements instead of administrative nuances, differences among the four maintenance programs - Engineered Operating Cycle, Progressive, Phased Maintenance, and the Aircraft Carrier Continuous Maintenance Programs - currently defined for ship maintenance are being minimized as the Navy transitions to Condition-Based Maintenance (CBM). The fundamental CNO-approved approach places the emphasis on ensuring a ship's commanding officer is provided the information and support needed to ensure a reasonable probability that the ship is ready for prompt and sustained combat operations at sea on a continuing basis. The basis for this information is principally the Maintenance and Material Management (3-M) system, which provides Maintenance Requirements Cards (MRCs) for organizational-level preventive maintenance actions, and the Maintenance Resource Management System (MRMS), which provides intermediate- and depot-level preventive maintenance actions via Master Job Catalog (MJC) items. MRCs and MJC items are developed by cognizant technical authority. MJC items shall provide fully detailed procedures for accomplishment of intermediate-level maintenance actions, but may reference other task-standard documents for the accomplishment of depot-level maintenance actions. Performance of these organizational-level MRCs and intermediate- and depot-level MJC items provides:

(1) Assurance that systems are operating within technical specifications.

(2) Assurance that proper maintenance actions (e.g., lubrication, greasing, and adjustments) are performed.

(3) Technical information that indicates system condition and can be used as the basis for determining required corrective maintenance.

(4) Technical information to be used by the technical community as the basis for determining process or technical changes.

(5) Technical information to be used as the basis for sustaining material certification.

d. Maintenance actions that are used to obtain objective evidence of equipment performance or condition trends are considered to be preventive maintenance.

2. Policy

a. Each ship class, including unique, single-ship classes, shall have a CNO-approved Maintenance Program.

(1) Preventive maintenance actions identified in a Maintenance Program for a ship class shall be developed using approved RCM techniques in accordance with reference (e). MRCs, for organizational-level preventive maintenance, and MJC items for intermediate- and depot-level preventive maintenance, shall be the reference documents for accomplishing these actions.

(2) Corrective maintenance determination shall be based on Condition-Based Maintenance (CBM) requirements, i.e., on objective evidence of need.

(a) Condition-directed repairs should be based on current evidence of degradation below system performance requirements. Insurance repairs should be based on material condition trend predictions of future degradation below system performance requirements.

(b) Where CBM diagnostics, inspections, or tests are unavailable or impractical to determine actual equipment condition or trends, time-directed repairs shall be based on engineering analysis such as assessment of the as-found material condition of components or systems when they are disassembled for maintenance or age-reliability analysis, including age-exploration.

(3) Maintenance actions shall be authorized to be performed by the lowest maintenance echelon that can ensure proper accomplishment, taking into consideration urgency, priority, capability, capacity, and cost.

(4) Effective use of specialized husbandry agents for maintenance determination, authorization, and management is encouraged where such use provides a clear value added.

(a) Husbandry agents shall meet qualifications established for performing specific functions of the maintenance program. For example, port engineers are expected to be highly qualified, licensed marine engineers with both an engineering degree and prior sailing and Port Engineer experience, or equivalent U.S. Navy ship repair experience.

(b) Husbandry agents normally shall be assigned responsibility for no more than two ships and shall be involved in the determination, planning, authorization, and execution of all intermediate- and depot-level maintenance actions.

(c) When performing duties in the areas of work determination, authorization, and execution, husbandry agents are responsible to the fleet.

b. The process for developing the maintenance program for new ship classes shall:

(1) Follow procedures specified in references (d) and (e) and incorporate existing maintenance requirements developed for specific systems and equipment.

(2) Apply both technical and cost criteria to maintenance decisions, providing due consideration to ship design and crew composition.

(3) Accommodate differences in intermediate- and depot-level industrial capability and capacity.

(4) Designate work to be accomplished at the lowest maintenance echelon that can ensure proper accomplishment, taking into consideration capability, capacity, and cost.

(5) Ensure that pre-depot-availability tests and inspections, required for maximum work identification, are developed. MRCs and MJC items shall be the reference documents for accomplishing these tests and inspections.

c. Maintenance programs for in-service ship classes should be reviewed for conformance with the guidelines of subparagraph 2b, and modified in areas where it can be determined that the expected results would be cost effective.

d. A CNO-approved Maintenance Program Master Plan shall be developed for each ship class. This plan shall describe the basic parameters of the maintenance program for that ship class. This includes:

(1) Establishing minimum organizational-level repair capabilities needed to satisfy operational requirements self-sufficiency objectives.

(2) Establishing the intermediate- and depot-level requirements (e.g., number, type, duration, interval between, and man-day size of availabilities).

(3) Identifying the maintenance approach used for critical systems and equipment.

(4) Identifying all required support features, including facilities requirements, specific turnaround programs, insurance material programs, special diagnostic systems, and husbandry agent (e.g., Port Engineers or AEGIS Homeport Engineering Teams) qualification and maintenance management requirements.

(5) Developing a plan of action and milestones for implementing, and improving, maintenance support requirements.

e. A COMNAVSEASYSCOM-approved Class Maintenance Plan (CMP) shall be developed for each ship class. The CMP is the principal document for executing the approved Maintenance Program Master Plan for a ship class. The CMP for a ship class shall describe all preventive maintenance actions and maintenance support requirements. This includes:

(1) Identifying all organizational-, intermediate-, and depot-level maintenance actions, engineered periodicities, and the maintenance echelon expected to accomplish each.

(2) Identifying those maintenance actions designated by the cognizant technical authority as mandatory or that RCM analysis has shown to be valid time-directed maintenance. Time-directed maintenance that is not condition-based should be minimized.

(3) Identifying those maintenance actions associated with assessing equipment condition, including pre-availability diagnostics, tests, and inspections performed by ship's force or by other maintenance support organizations.

(4) Providing details regarding the level of effort or involvement of each maintenance support organization and program designated in the Maintenance Program Master Plan.

f. MRCs and MJC items may be incorporated or referenced in the CMP for each ship class.

g. MRC and MJC item periodicities shall be modified based on the results of RCM experience. These periodicities are to be used as a scheduling tool for accomplishment of the maintenance action.

h. MRC and MJC item actions shall include diagnostics, tests, inspections, and selected acceptance criteria to determine the need for condition-directed maintenance.

i. The CMP is the core of the logistics program developed for each ship class. The translation of these plans into maintenance actions requires the development and maintenance of MRCs and MJC items for the assessment of equipment condition, determination of maintenance requirements, and execution of maintenance actions.

j. A thorough knowledge and assessment of actual equipment condition in relation to its minimally acceptable condition is the basis for maintenance decisions. Equipment condition is a broad term that of necessity includes static parameters, such as size, shape, and the extent of material degradation observed from prior maintenance on similar or the same components, and dynamic parameters, such as speed, temperature, pressure, and electrical characteristics. Ship's force is required to know the condition of its ship and equipment.

k. The complexities of shipboard systems and equipment have necessarily led to the development of other supporting organizations, programs, requirements documentation, and information systems to augment the original MRC and MJC item process. These support organizations, programs, requirements documentation, and information systems should be: continually reviewed for effectiveness; integrated, consolidated, or standardized, as practicable; and modified, as appropriate, to maximize fleet self-sufficiency. Examples are:

(1) Support organizations:

- Planning and Engineering for Repairs and Alterations (PERA)
- Submarine Maintenance Engineering, Planning, and Procurement (SUBMEPP)
- In-Service Engineering Agent (ISEA)
- Fleet maintenance personnel

(2) Support programs:

- Integrated Logistic Overhaul (ILO)
- Integrated Logistic Review (ILR)
- Advanced Industrial Management (AIM) Program

(3) Supplementary requirements documentation:

- Naval Ships' Technical Manuals (NSTMs)
- System, subsystem, and equipment technical manuals
- Technical specifications and standards

(4) Supplementary information systems:

- Ship Configuration Logistics Support Information System (SCLSIS)
- Navy Advance Technical Information System (ATIS)
- Maintenance Resource Management System (MRMS)

l. Depot- and intermediate-level repair work determination shall be based on:

(1) Current Ship Maintenance Project (CSMP) records of deferred and completed maintenance.

(2) Objective evidence of degradation or failure determined by results of MRCs or MJC items conducted by ship's force or support programs.

(3) Material condition trend predictions of future failure.

(4) Time-directed maintenance which is based on age-reliability analysis, appropriate distribution of failures, and availability of an applicable maintenance action.

m. Depot-level availability repair work authorization shall be based on assessment of the relative risk of non-accomplishment to personnel safety and ship mission readiness. Authorization of repair work items shall be prioritized in descending order of risk to personnel safety and mission readiness. Relative risk is the product of the probability of failure before the next scheduled availability and a measure of the severity of failure.

n. Reactor plant maintenance, repair, and modernization in nuclear powered warships shall be programmed in accordance with requirements and policies established by the Director, Naval Nuclear Propulsion (CNO (N00N), COMNAVSEASYSCOM (SEA-08)).

o. Maintenance and repair work essential for safe and reliable nuclear propulsion plant operations and submarine submerged operations shall not be deferred from one depot-level maintenance period to the next.

3. Repair Procedures and Support

a. Repair Determination. FLTCINCs, acting through their Type Commanders (TYCOMs), or other designated subordinates, shall determine the repair actions required to maintain or restore equipment to its intended condition based on technical requirements defined by the cognizant technical authority. This determination shall use RCM principles. Repair determination assistance is available through various programs, organizations, and information systems within the fleet and SYSCOMs. Examples are:

(1) Repair determination programs:

- Material Condition Assessment (MCA)
- Test and Monitoring Systems (TAMS)
- Shipboard Instrumentation and Systems Calibration (SISCAL)
- Pre-Overhaul Tests and Inspections (POT&Is)
- Work Definition Inspections (WDIs)
- Fleet Inspections
- Machinery History and Trend Analysis
- Submarine Safety Certification (SUBSAFE) Program
- Assessment of Equipment Condition (AEC) Program

(2) Repair determination organizations:

- Board of Inspection and Survey (INSURV)
- Submarine Monitoring, Maintenance and Support Program Office (SMMSO)
- Submarine Maintenance Engineering, Planning, and Procurement (SUBMEPP)
- Performance Monitoring Teams (Surface and Submarine)

(3) Information systems:

- Current Ship Maintenance Project (CSMP)
- Planned Maintenance System (PMS)

b. Repair Authorization. FLTCINCs, acting through their TYCOMs or other designated subordinates, shall authorize required maintenance actions based on safety considerations and on cost, schedule, and mission trade-offs, as required. The choice of required maintenance actions to be authorized shall be based on evaluation of risk to personnel safety and ship mission readiness imposed as a result of those maintenance requirements deferred. Acceptance of risk is unavoidable; proper management of risk is essential.

c. Repair Execution. Repairs shall be executed, in accordance with technical requirements, at the lowest level practicable that can assure proper accomplishment. If funding constraints exist, priority must be placed on providing ships that can safely and reliably perform their missions.

d. Reactor plant maintenance, repair, and modernization shall be performed in accordance with requirements established by COMNAVSEASYSCOM (SEA-08).

4. Responsibilities

a. CNO. The CNO Operational Forces Resource Sponsors (N85, N86, N87, and N88) will:

(1) Approve all Maintenance Program Master Plans, and any modifications to these plans, for their respective platforms.

(2) Plan and program the resources required to fully support their Maintenance Program Master Plans, including resources for organizational-, intermediate-, and depot-level maintenance.

(3) Monitor Maintenance Program Master Plan compliance.

b. FLTCINCs. The FLTCINCs shall:

(1) Participate with Program Executive Offices (PEOs), Direct Reporting Program Managers (DRPMs), and Ship Program Managers (SPMs) in the development of the Maintenance Program for each ship class.

(2) Execute each program in strict accordance with this instruction and specific guidance provided in the ships' CMPs.

(3) Manage risks inherent in making maintenance decisions. Prudent risk is acceptable; no maintenance decision is risk free.

(4) Assist the PEO, DRPM, or SPM in determining husbandry agent qualifications and maintenance management requirements.

c. COMNAVSEASYSCOM. COMNAVSEASYSCOM shall:

(1) Develop, issue, and maintain organizational-level MRCs and intermediate- and depot-level MJC items.

(2) Assist Program Executive Offices (PEOs) and Direct Reporting Program Managers (DRPMs) in developing Maintenance Program Master Plans and CMPs.

(3) Review and approve CMPs, including those developed by PEOs and DRPMs, ensuring that they satisfy the requirements of this instruction, are technically correct, and are best suited to individual ship classes.

(4) Recommend changes to existing maintenance programs and CMPs that: support Navy's continued drive toward integration, standardization, and fleet self-sufficiency; are based on RCM experience; and are cost effective.

(5) Ensure effective support of maintenance determination, planning, and execution by field activities, and continuously improve maintenance procedures and technology.

d. PEOs, DRPMs, and SPMs. PEOs, DRPMs, and SPMs shall:

(1) Develop a Maintenance Program Master Plan, for CNO approval, that is best suited to an individual ship class, that supports fleet mission and material readiness needs, and is cost effective.

(2) Develop, for COMNAVSEASYSCOM approval, promulgate, and maintain CMPs based on approved Maintenance Program Master Plans and the requirements of this instruction. The CMP shall be promulgated by delivery of the first ship of the class.

(3) Ensure adequate logistics support for their Maintenance Programs.

e. Director, Naval Nuclear Propulsion (CNO (N00N), COMNAVSEASYSCOM (SEA-08)). SEA-08 is responsible for establishing nuclear powered warship reactor plant maintenance, repair, and modernization requirements and policies.

MINIATURE/MICROMINIATURE (2M) ELECTRONIC REPAIR

1. Definition

a. Miniature Electronic Repair. Miniature electronic repair is defined as the repair of single-sided and double-sided printed circuit boards, including the removal and installation of dual-in-line packages and other micro-electronic packages; the repair of printed circuit board laminate and printed wiring; and the removal and application of conformal coating. However, such repairs are authorized only under the Miniature/Microminiature (2M) Electronic Repair Program with the proper training, parts, and equipment.

b. Microminiature Electronic Repair. Microminiature electronic repair is defined as the repair of multi-layer printed circuit boards, usually requiring sophisticated equipment, such as stereo microscopes. Microminiature electronic repair includes repairs to multi-layer printed circuit boards, modules, and small "daughter" boards which are too complex or dense for miniature electronic repair; repairs to flexible printed circuit boards and printed circuit cables; removal and installation of special connectors, eyelets, and terminals; electroplating, micro-soldering, and complete rebuilding; repairs to optical encoders and edgelighted panels; and repairs to ceramic and composite printed circuit boards.

2. Limitations. The 2M Electronic Repair Program excludes internal repairs to micro-electronic components, but their removal or replacement is acceptable. Other exclusions include internal repairs to critically sensitive components, such as miniature radio frequency balanced mixers, or repairs that require special calibration and test equipment not available to the maintenance activity.

3. Discussion

a. Electronic systems with removable circuit boards are characterized by increased packaging complexity, multi-layer construction, and the extensive use of microminiature devices and subminiature components. The increased use of such sophisticated systems and equipments calls for expanded electronic repair capability at all maintenance levels. This capability must include properly trained personnel, adequate repair and test equipment, and special facilities.

b. The 2M Electronic Repair Program provides the tools, test equipment, documentation, and training for the repair of printed circuit boards and electronic assemblies. The program covers ships, IMAs, and designated shore activities that directly support the fleet.

c. Support and Test Equipment Engineering Program (STEEP). This program provides the automatic test equipment, procedures, documentation, and training for 2M electronic repair stations.

4. Policy. There are two principal categories of 2M repair: normal repair, and emergency repair. All 2M repair actions, regardless of category, must be performed by certified technicians utilizing certified facilities. The Source, Maintenance, and Recoverability (SM&R) code identifies the maintenance levels that may remove, repair, replace, or condemn an item.

a. Normal Repair. Normal repair is the application of a progressive repair concept consisting of sequential attempts to repair an item following the established organizational-, intermediate-, and depot-level repair hierarchy. If a ship has certified technicians and facilities, organizational-level test or repair is attempted prior to obtaining a replacement item from the supply system. If ship's force is unable to repair the item, it is shipped to an intermediate maintenance activity (IMA) for further inspection. The IMA will verify the condition of the printed circuit boards and miniature electronic components and conduct intermediate-level repairs, if possible. If the IMA is unable to repair the item, and it is deemed repairable, it is designated as a Depot Level Repairable (DLR) and is shipped to a depot facility for further inspection and repairs. Only an IMA or depot facility can determine that an item should be discarded because it is not repairable.

b. Emergency Repair. Emergency repair is a repair deemed to be beyond organizational level that has been authorized by a ship's commanding officer because of operational necessity. Even if this repair is considered adequate, the item will be designated for intermediate-level repair and shipped to an IMA, with associated repair and test documentation, when ship operations permit. The IMA will complete actions as indicated in subparagraph 3a.

c. The condition of an item must be verified at a 2M station before discard. Ships should send items that are coded for organizational-level discard to an IMA for verification and possible repair.

d. Technicians who repair electronic assemblies and subassemblies must receive formal training and certification in miniature or microminiature repair. While on-the-job training is valuable, it is not acceptable for certification.

e. Ship and ship systems'maintenance activities performing miniature and microminiature electronic repair must meet the technical criteria established by Commander, Naval Sea Systems Command (COMNAVSEASYSCOM).

5. Responsibilities

a. Chief of Naval Operations (CNO). CNO (N43) is the program and resource sponsor for the 2M Electronic Repair Program. As such, N43 is responsible for properly funding the program and providing policy and guidance, as required.

b. Fleet Commanders in Chief (FLTCINCs). FLTCINCs shall:

(1) Operationally administer the 2M Electronic Repair Program at the organizational and intermediate levels.

(2) Identify outfitting requirements and priorities.

(3) Inspect and certify 2M repair facilities and technicians in accordance with established COMNAVSEASYSCOM procedures.

(4) Ensure that 2M training is provided to personnel as required to maintain 2M station certification requirements.

(5) Distribute electronic 2M repair kits to certified 2M repair facilities.

(6) Ensure that only certified facilities perform 2M repair and that repairs are accomplished at the lowest level practicable.

(7) Ensure that all 2M maintenance actions accomplished are documented in accordance with reference (f).

c. COMNAVSEASYSCOM. COMNAVSEASYSCOM shall provide technical direction and implement the 2M Electronic Repair Program Automatic Test Equipment (ATE) Program in accordance with reference (w). COMNAVSEASYSCOM shall also:

(1) Provide overall 2M Electronics Repair Program management and establish procedures for orderly program direction.

(2) Acquire and deploy 2M equipment and integrated logistics support, including automatic and manual test equipment.

(3) Coordinate the development and distribution of all Test Program Sets (TPSs) and Gold Disks.

(4) Establish 2M standards for test and repair of shipboard electronic equipment.

(5) Develop, maintain, and acquire consolidated repair part allowances for each 2M activity.

(6) Develop and maintain SM&R codes for all 2M-program-cognizant printed circuit boards.

d. Program Executive Officers (PEOs), Direct Reporting Program Managers (DRPMs), Ship Program Managers (SPMs), and System and Equipment Acquisition Managers. PEOs, DRPMs, SPMs, and System and Acquisition Managers shall comply with reference (w) for the incorporation of progressive repair of electronic end items into Class Maintenance Plans.

e. Chief of Naval Education and Training (CNET). CNET, in coordination with COMNAVSEASYSCOM and the FLTCINCs, shall provide training facilities, curricula, and instructors for the 2M Electronic Repair Program.

f. Commander, Naval Supply Systems Command (COMNAVSUPSYSCOM). COMNAVSUPSYSCOM shall direct the distribution of stock for electronic end-item-repair rotatable pools as requested by the FLTCINCs.

MOBILE TECHNICAL UNITS

1. Definition. Mobile Technical Units (MOTUs) are fleet activities located at areas of major fleet concentration. The mission of the MOTUs is to improve fleet combat system readiness by promoting the technical self-sufficiency of organizational- and intermediate-level activity personnel, primarily through on-the-job training in the maintenance and operation of combat system equipment.

2. Discussion

a. MOTU training may be conducted in a classroom, but is normally accomplished in the form of on-board technical assistance. As such, it frequently coincides with the correction of technical problems that are beyond the capability of ship's force. MOTU training may also consist of reviews, tests, or trials of system performance. MOTUs also recommend certification of miniature/microminiature (2M) repair stations and 2M technicians.

b. MOTUs are manned primarily by senior enlisted personnel (E-7 through E-9) with technical and personal skills suitable for their training mission. Department of Defense (DOD) contractor technical programs, Contractor Engineering Technical (CETS) and Fleet Engineering Technical Services (FETS), cover military manpower shortages for new systems whose logistics support is not adequate or for other important, complex equipment with maintenance problems. Additionally, a small number of civil service personnel work in MOTUs to provide continuity and training for MOTU enlisted personnel.

c. The FLTCINCs coordinate the travel of MOTU personnel to efficiently distribute resources. MOTUs may be required to deploy aboard ships, to augment existing MOTUs overseas, or establish a technical assistance team at a new site.

3. General Policy

a. It is the Navy's goal that ships are to be as self-sufficient as possible. Consequently, MOTUs should develop the technical capability and expertise of ship's force personnel to improve the material readiness of combat and electronic systems. Ship's force personnel who operate and maintain these systems must participate with the MOTU representative whenever possible.

b. Senior enlisted personnel are assigned to provide meaningful shore billets and hands-on experience that will contribute to their ship's self-sufficiency upon their return to sea.

c. MOTUs should not be used as an alternative to intermediate-level maintenance. IMAs should be used, when possible, to ensure that proper intermediate-level maintenance skills are maintained.

4. <u>Responsibilities</u>

a. <u>Chief of Naval Operations (CNO)</u>. CNO (N43) is responsible for establishing general policy and guidance concerning MOTU mission and utilization.

b. <u>FLTCINCs</u>. FLTCINCs are responsible for:

(1) Providing personnel to MOTUs.

(2) Managing MOTU resources.

(3) Establishing procedures to utilize MOTU capabilities efficiently.

QUALITY MAINTENANCE

1. Background. Performing maintenance in accordance with published technical and quality assurance requirements is a long-standing policy. Quality assurance requirements carry equal weight with the technical requirements in the overall objective of quality maintenance. The technical complexity of present day ships reenforces the need for strict compliance with administrative and technical direction to ensure conformance to technical requirements during maintenance. Seemingly trivial or minor deviations from requirements have resulted in the loss of life and degradation of ships' readiness.

2. Policy

a. Quality maintenance requires the proper execution of responsibilities by each individual involved in the planning, logistics support, and execution of the maintenance process. Workers and planners will be provided adequate tools, guidance, training, resources, and time to perform quality maintenance. Failure to consistently accomplish first time quality maintenance should be viewed as a weakness or breakdown in the process. Reasons for failure should be identified and the process examined for modification, as appropriate.

b. Maintenance of ship systems and equipment shall be performed by qualified personnel using correct procedures and material in accordance with technical requirements promulgated by the appropriate technical authority. Policy and direction issued by the Fleet Commanders in Chief (FLTCINCs), COMNAVSEASYSCOM, or their subordinate activities shall comply with such technical requirements. FLTCINCs and COMNAVSEASYSCOM shall ensure procedures addressing deviations to technical requirements are established. These procedures shall:

(1) Ensure that the activity, when finding itself unable to comply with technical requirements, recommends to the appropriate technical authority a repair which the activity considers achievable and which will ensure the needs of the fleet are satisfied.

(2) Differentiate between categories of repair, and identify, by each category of repair, the appropriate technical

authority that can authorize deviation from technical requirements.

(3) Ensure work does not proceed until concurrence from appropriate technical authority is received.

(4) Ensure cognizant technical authority revises applicable technical requirements, or documents a deviation from technical requirements, to reflect resolution of the repair.

c. Compliance with quality maintenance requirements will be validated by independent oversight in the form of audits and inspections.

3. Responsibilities

a. FLTCINC. The FLTCINCs are responsible for safe and effective maintenance of their assigned ships. They shall:

(1) Ensure their Type Commanders (TYCOMs) or other designated subordinate commands utilize approved processes for maintenance.

(2) Ensure all organizational- and intermediate-level maintenance is accomplished in accordance with the cognizant Systems Commander (SYSCOM) technical specifications and requirements. When this requirement can not be satisfied, action shall be taken as outlined in subparagraph 2b.

(3) Maintain positive control over the maintenance practices of subordinate commands to ensure compliance with the standard Navy-wide maintenance policy.

(4) Provide guidance to facilitate the development of joint policy instructions and notes, addressing the following as a minimum:

(a) Administrative requirements.

(b) Organizational- and intermediate-level maintenance activity quality assurance organization and execution requirements.

(c) Responsibilities of organizational- and intermediate-level activity personnel relating to the definition and oversight of maintenance performed by depot activities.

(d) Situational responsibility and accountability guidance.

(5) Assign quality assurance responsibilities.

(6) Advise the Chief of Naval Education and Training (CNET) and provide guidance to Fleet Training Centers concerning new training requirements identified as a result of work-procedure development, changes in current maintenance performance, and evaluations of maintenance quality problems.

(7) Ensure that Ship Repair Facilities (SRFs) comply with technical and quality requirements promulgated by the Commander, Naval Sea Systems Command (COMNAVSEASYSCOM).

b. COMNAVSEASYSCOM. As the lead hardware systems commander for the life cycle management of ships, COMNAVSEASYSCOM shall:

(1) Develop the technical requirements necessary for performing quality maintenance. This includes promulgating and maintaining such technical documentation as current selected record data and Navy equipment drawings, technical manuals, calibration and repair standards, test requirements, and plans, as required.

(2) Identify those systems, portions of systems, or components that, due to their essentiality, complexity, cleanliness or material requirements, must have additional process controls to ensure that technical requirements are met.

(3) Develop and manage special programs to implement additional process controls for those systems and components identified as requiring such.

(4) Provide necessary technical support and oversight of Naval Shipyards (NSYs) and Supervisors of Shipbuilding, Conversion and Repair (SUPSHIPs).

(5) Provide technical support to FLTCINCs to ensure quality objectives are met.

(6) Ensure all depot-level maintenance is accomplished in accordance with cognizant SYSCOM technical requirements and specifications. When this requirement can not be satisfied, action should be taken as outlined in subparagraph 2b.

(7) Issue quality assurance policy for NSYs, Ship Repair Facilities (SRFs), and SUPSHIPs for depot-level maintenance.

(8) Assist and advise FLTCINCs to ensure that guidance provided in such areas as work-procedure preparation, material requirements and control, work control, testing, and certification instructions are technically correct and consistent with Navy quality objectives.

(9) Advise CNET of new training requirements identified with new procedures, systems, or troubleshooting techniques.

(10) Provide Commander, Naval Supply Systems Command (COMNAVSUPSYSCOM) with the following:

(a) Sufficient, accurate, and up-to-date technical information to ensure consistent procurement and control of material that fulfills all technical requirements.

(b) Assistance in the evaluation of discrepancies reported through the Quality Deficiency Report (QDR) Program.

(c) Assistance in determining whether or not the severity of a reported problem warrants purging of supply system stocks. If purging is required, details of the inspection characteristics and methods should be provided, including the scope of the action to be taken.

c. Other Hardware System Commanders (SYSCOMs). Commander, Naval Air Systems Command (COMNAVAIRSYSCOM) and Commander, Space and Naval Warfare Systems Command (COMSPAWARSYSCOM) shall:

(1) Coordinate, with COMNAVSEASYSCOM, in the development of technical requirements essential to performing quality maintenance. This includes promulgating and maintaining such technical documentation as current selected record drawings and Navy equipment component drawings, technical manuals, calibration and repair standards, test requirements, and plans, as required.

(2) Identify to COMNAVSEASYSCOM those systems, portions of systems, or components that, due to their essentiality, complexity, cleanliness or material requirements, must have additional process controls to ensure that technical requirements are met.

(3) Assist COMNAVSEASYSCOM in the development of the additional process controls required to ensure that proper maintenance actions or repairs are performed.

(4) Provide COMNAVSEASYSCOM and FLTCINCs necessary technical support to ensure that quality objectives are met.

(5) Assist or advise FLTCINCs to ensure that guidance provided in such areas as work-procedure preparation, material requirements, work control, testing, and certification instructions are technically correct and consistent with Navy quality objectives.

(6) Advise CNET of training requirements identified with work procedures, systems, and troubleshooting techniques.

(7) Provide COMNAVSUPSYSCOM with the technical information and assistance outlined in subparagraph 3b(10).

d. COMNAVSUPSYSCOM. COMNAVSUPSYSCOM is responsible for procurement of material in accordance with technical specifications provided by the hardware SYSCOMs. COMNAVSUPSYSCOM shall:

(1) Control material designated by hardware SYSCOMs for special programs such as Level I and Submarine Safety (SUBSAFE) in accordance with cognizant SYSCOM procedures.

(2) Provide or support material control training for those supply personnel who receive, handle, and issue material for designated special programs.

(3) Take action to ensure rapid correction of quality deficiencies as they are identified, utilizing guidance received from the cognizant SYSCOM.

e. CNET. CNET is responsible for providing effective training in maintenance skills for military personnel in accordance with reference (p). CNET shall:

(1) Emphasize quality maintenance principles in all leadership, management, and maintenance courses.

(2) Develop new quality oriented leadership, management, and maintenance courses as required by FLTCINCs and SYSCOMs.

(3) Ensure that appropriate shipboard quality assurance fundamentals are included in rate advancement examinations.

Document Separator

Document Separator

United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Military Acquisition, Committee on Armed Services, House of Representatives

For Release on Delivery Expected at 10:00 a.m., EDT, Tuesday, April 26, 1994

NAVY MODERNIZATION

Alternatives for Achieving a More Affordable Force

Statement of Richard A. Davis, Director, National Security Analysis, National Security and International Affairs Division

GAO/T-NSIAD-94-171

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to be here today to discuss the affordability of the Navy's recapitalization program and alternatives that would result in a more affordable Navy. Before I discuss specifics, let me summarize our views on these issues.

The Navy will be asking Congress for billions of dollars in the coming years to recapitalize the fleet and maintain the defense industrial base. Even if the Congress authorizes the programs being requested, the Navy will face an affordability problem. Past experience strongly suggests that some costs will be higher than projected and some savings will fail to materialize. More importantly, we believe that there are alternatives to the Department of Defense (DOD) and Navy proposals that could effectively protect national security at a significantly lower cost. These alternatives include using less costly means to provide overseas presence, using existing aircraft and missiles for deep attack, and changing shipbuilding industrial base-related decisions.

BACKGROUND

To realize the strategy and force structure articulated in DOD's Bottom-Up Review, the Navy plans to decommission ships and aircraft squadrons, reduce its authorized personnel, and eliminate unnecessary support facilities. Table 1 shows the number of ships, submarines, and aircraft squadrons that the Navy plans to have decommissioned by 1994 and 1999, respectively.

Table 1: Decommissioned Ships, Submarines, and Aircraft Squadrons

	1985-94	1995-99
Ships	266	68
Submarines	67	39
Aircraft Squadrons	94	39

As part of this drawdown, the Navy plans to completely eliminate some ships and aircraft from its inventory--such as the FF-1052 class frigates and the A-6 attack aircraft.

By making these significant reductions, the Navy hopes to produce a balanced and affordable Navy for the next century. It also hopes to protect major procurement programs such as the DDG-51, CVN-76, new attack submarine, SSN-23, F/A-18 E/F, medium lift alternative aircraft, and LPD-17 (LX).

From fiscal year 1988 through 1994 the Navy's total obligation authority declined from $126 billion to $79 billion (a 37-percent decrease in constant 1995 dollars). During the same period, the Navy's procurement account declined from $45 billion to $17 billion (a 63-percent decrease in constant 1995 dollars).

Table 2 shows that the Navy's total obligational authority is projected to increase slightly from fiscal year 1995 through 1999. This is not enough to keep overall Navy funding from decreasing after inflation. The procurement account is projected to grow by about 50 percent from $16.6 billion in fiscal year 1995 to $24.8 billion in 1999. Aircraft procurement and shipbuilding and conversion are projected to increase the most. This will require decreases in other appropriation accounts.

Table 2: Navy[a] Obligational Authority (Fiscal Years 1995-99)

Dollars in millions

Account	1995	1996	1997	1998	1999
Military personnel	$25,106	$23,958	$23,528	$23,533	$23,915
Operations and maintenance	24,055	21,158	20,894	20,711	21,619
Procurement	16,646	18,500	19,922	25,094	24,822
RDT&E[b]	8,935	8,433	7,847	7,281	6,966
Military construction	2,150	2,953	1,511	1,706	1,157
Family housing	1,083	1,212	1,241	1,221	1,269
Revolving and management funds	609	622	1,169	619	2
Total	**$78,583**	**$76,837**	**$76,111**	**$80,154**	**$79,750**
Constant 1995 dollars	$78,583	$74,868	$72,136	$73,868	$71,454

[a]Includes Marine Corps.

[b]Research, development, test, and evaluation.

The Navy plans to spend about $120 billion beyond 1999 to complete programs such as the F/A-18E/F and DDG-51 that are in production during the period 1995 through 1999. However, this does not include the procurement costs for planned new multibillion acquisitions. The Navy estimates that aircraft and ship procurement beyond 1999 will average $3.5 billion more per year than the average for the period 1995 through 1999. Since the average annual procurement for aircraft and ships for this period is $14 billion, this would represent an increase of about 25 percent.

NAVY AFFORDABILITY PROBLEMS

The Navy acknowledges significant risks in its ability to pay for its procurement plans. It identified four areas of risk as the most serious: unforeseen changes in the world security environment that require more than currently programmed assets; unanticipated cost growth in future systems and programs due to rising inflation and industrial base problems; increased readiness costs due to unforeseen contingency operations; and underestimated costs arising from the Base Closure process. We agree that the Navy has significant risks in its procurement plans. First of all, DOD's projected expenditures already exceed its projected budgets. Secondly, there is no reason to expect that DOD and Navy experience with cost growth will not continue. Thirdly, the savings the Navy expects over the next 5 years likely will not materialize.

Program for Fiscal Years 1995-99 Is Over Budget

DOD has acknowledged that its defense program for fiscal years 1995 through 1999 is over budget by about $20 billion. DOD indicates that the gap may be closed because of lower inflation rates over the 5-year period. However, we believe inflation could also increase and widen the gap. Assuming that the $20 billion gap remains, the Navy's share could be about $6 billion.

Weapons Systems Cost Growth May Be Underestimated

In the past, DOD and the Navy have been overly optimistic in projecting the cost of major weapons systems. In August 1992 we reported that the potential total cost for completing 165 ships under construction had increased by 24 percent. A 1993 RAND Corporation report showed that cost growth of 200 major weapons systems, including numerous Navy systems, averaged about 20 percent over a 30-year period despite several initiatives intended to mitigate such growth. What follows are examples of several of the Navy's current major weapons system acquisitions that have experienced greater cost growth than this historical average:

-- In September 1992, we reported that the cost estimates for the first three ships built under the DDG-51 shipbuilding contracts were $1.1 billion, double the original cost estimates.

-- In August 1993, we reported that the design cost estimate more than doubled and the construction cost estimate increased by 45 percent for the first Seawolf submarine (SSN-21). As of December 1993, the total construction cost was estimated at $1.1 billion, 59 percent over the original estimate.

-- In August 1993, we reported that three Navy supply ships had experienced cost growth of over 42 percent resulting in over $300 million in claims by the shipbuilder.

-- In January 1994, we reported that the Navy could invest twice the original estimate to develop the V-22 tilt-rotor aircraft--from $2.5 billion to $5 billion. In December 1989, DOD determined that the V-22 would cost $42 million each, which at that time was not considered affordable compared with other helicopter alternatives. The Navy now estimates its V-22 variant could cost between $49 and $64 million each.

Included in the Navy's fiscal years 1995-99 research and development and procurement accounts is about $105 billion for weapons systems. On the basis of historical experience of 20-percent cost growth for weapons systems, it is not unreasonable to expect the total cost of Navy systems alone to grow by $20 billion or more above the estimates included for the 5-year period.

The cost of weapons systems beyond 1999 may be an even greater problem. As mentioned earlier, the Navy already plans to spend $120 billion on the F/A-18E/F and other systems. These systems will probably experience additional cost growth. Moreover, the $120 billion does not include the cost of a new attack submarine, a new tactical fighter currently being developed in the Joint Advance Strike Technology program, and the aforementioned variant to the V-22.

Environmental Cleanup Costs May Be Understated

According to the Congressional Budget Office (CBO), DOD plans to spend about $12 billion on environmental restoration during the period 1995-99. These costs are for cleanup programs, which are used to fix problems at active or closed bases or on ships. In addition, DOD's Future Years Defense Plan for fiscal years 1995-99 includes about $9 billion for environmental compliance programs, which are used to resolve pollution problems and comply with current state and federal regulations.

We have issued several reports on environmental cleanup and compliance issues indicating that total environmental costs could be higher than DOD's estimates. We reported that the actual cost cannot be determined because not all sites have been identified; contamination studies have not been completed; additional work is required at some installations; and the longer cleanup activities take, the more expensive they will be. Also, DOD's estimates for compliance costs do not include all expenses. Moreover, although DOD estimated that its compliance costs will decline between 1993 and 1999, we believe they are likely to increase because new requirements cannot always be predicted and DOD has generally underestimated costs to comply with environmental regulations.

CBO recently estimated that DOD's environmental cleanup costs could be $20 billion higher than that estimated for fiscal years 1995 through 1999. In recent years the Navy's portion of DOD's estimated environmental cleanup costs has been about 20 to 25 percent.

Base Closure Savings May Be Overestimated

The Navy plans net savings of about $1 billion from 1995 through 1999 from base closures and realignments. Our work shows that these savings may be optimistic. For example, we reported in March 1993 that DOD's budget estimates for the base closures and realignment decisions made in 1988 more than doubled between fiscal years 1991 and 1993 largely because DOD's projections for land revenues declined dramatically. Moreover, Navy officials recently indicated that some of the base closure savings identified for the 5-year period will not come to fruition until after 1999.

Consolidations and Management Improvements May Be Overstated

The 1989 Defense Management Report (DMR) proposed a series of consolidations and management improvements that were estimated to save tens of billions of dollars in support and overhead costs. In past work on the DMRs, we have questioned whether all of the estimated savings could be achieved. Our work on specific initiatives found that up to 82 percent of the planned savings were based on management judgment and were not always supported by historical facts or empirical cost data. In April 1994 we reported that DMR savings for DOD may be overstated by as much as $32.2 billion for fiscal years 1994 through 1999. It is not clear how much of the overstated savings will impact the Navy, however, the Navy's expected share of past DMR savings was about one-third of the total.

ALTERNATIVES FOR A MORE AFFORDABLE NAVY

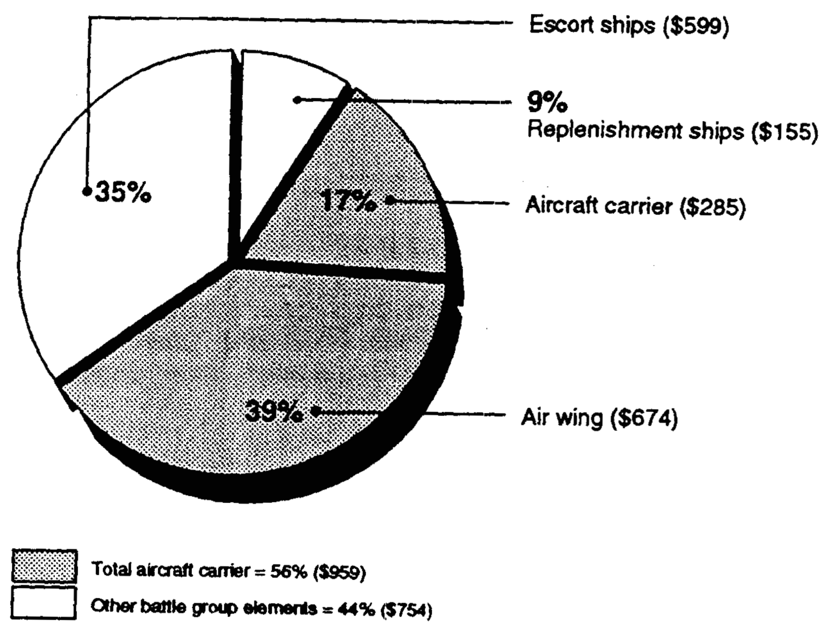
Because the Navy is unlikely to have the funds necessary to execute its current plan, we believe the Congress, DOD, and the Navy should consider alternatives to provide overseas presence and deep strike missions. In addition, we believe that savings may be possible if industrial base-related decisions are changed.

Navy Could Reduce Number of
Carriers Used for Overseas Presence

Overseas presence in major world regions has been met primarily by aircraft carriers and their battle groups. DOD and the Navy want to keep two more carriers than are needed to prosecute two nearly simultaneous regional conflicts. According to DOD and the Navy, these carriers are needed to provide overseas presence. In the Bottom-Up Review DOD states that 12 carriers (11 active plus 1 operational reserve) would provide continuous presence in one region and about 8 months presence in the other two regions. According to the Bottom-Up Review, a 10-carrier force would be insufficient because the Navy could provide continuous presence in one region but only 6 months presence in the other two regions. The Bottom-Up Review does not explain why 4-month gaps in two regions is acceptable and 6-month gaps are not.

Our work suggests the Navy could reduce the number of carriers and achieve substantial savings. In our February 1993 report on carrier battle groups, we said that relying on aircraft carriers for overseas presence is costly. We estimated that a notional carrier battle group--consisting of an aircraft carrier, combat and support aircraft, surface combatants, attack submarines, and logistics ships--costs almost $1.7 billion (in fiscal year 1995 dollars) each year to acquire, operate, and support. This cost increases significantly when indirect costs are considered. Examples of these are the Navy's physical infrastructure of bases and air stations and the personnel assigned to shore command, support functions, and reserve units. Figure 1 breaks down the battle group's annualized direct costs for each of the group's major components. The aircraft carrier and its air wing make up about 56 percent ($959 million fiscal year 1995 dollars) of the costs of the group, with the air wing contributing the largest part of carrier costs.

Figure 1: Breakout of the Annualized Costs for a Carrier Battle Group



Because of Navy operating, maintenance, and personnel policies, it takes a significant number of carriers to maintain presence in each of the three major regions. For example, as many as eight carriers are required to maintain one carrier more or less continuously in the Indian Ocean/Arabian Sea at an annual cost of nearly $14 billion.

In our report, we showed that there are opportunities for using less costly ways to meet overseas presence requirements without unreasonably increasing the risk to U.S. national security. Using groups centered around highly capable surface combatants and amphibious assault ships could provide a very credible and capable presence under most circumstances at a much reduced cost. An example taken from our report illustrates the cost differences of operating alternative mixes of carrier battle groups and surface action groups.[1] As shown on table 3, the annual cost of a 10-carrier force level with two surface action groups would be about $2.7 billion less than at a 12-carrier force level without any surface action groups.[2]

Table 3: Annual Costs of Carrier Battle Group and Surface Action Group Force Mixes

Fiscal year 1995 dollars in millions

Carrier battle groups		Surface action groups		
Number	Cost	Number	Cost	Total cost
12	$19,252	0	$0	$19,252
11	17,587	1	337	17,923
10	15,922	2	673	16,595
9	14,256	3	1,010	15,266

[1]An illustrative carrier battle group consists of an aircraft carrier, its air wing of about 80 aircraft, and about 9 escort ships, including surface combatants, attack submarines, and logistics support ships. An illustrative surface action group consists of a cruiser, two destroyers, a frigate, and an attack submarine.

[2]We used composite costs to characterize the cost of different force components (i.e., ship types and carrier air wings) based on the Navy's force structure in fiscal year 1990. These cost estimates are annualized to reflect the average cost each year for the force component over its expected service life. Our calculations do not include the cost of the underway replenishment group.

We believe that expanded use of noncarrier groups is possible because of the increased capabilities of the ships and weapon systems in these groups. The surface combatants, attack submarines, and amphibious ships now entering the fleet are significantly more capable both offensively and defensively than those that made up most of the force during the Cold War. New multipurpose amphibious ships can provide a limited, but effective strike capability with Harrier aircraft, armed helicopters, and expanded command and control facilities. The Navy currently has 11 of these moderately-sized "aircraft carriers," which are comparable to carriers of other world navies. Surface combatants now entering the fleet can provide significant strike, anti-air, anti-surface, and anti-submarine capabilities, making them highly suitable for regional contingencies. Improvements in Tomahawk cruise missiles, the Vertical Launching System, and the AEGIS anti-air weapon system are adding more capability.

Our work on the Tomahawk cruise missile shows that it can provide a viable strike capability in the absence of carrier-based aircraft. For example, in January 1993, Tomahawks were successfully used to strike the Zafraniyah nuclear facility in Iraq. Tomahawks were chosen to avoid the potential loss of pilots or aircraft. They were used again in June 1993 to strike the Iraqi intelligence service in Baghdad. An aircraft carrier was not present in the theater at that time.

By the end of this decade, the Navy will have about 130 ships and submarines with Tomahawk capabilities. Tomahawk-capable warships and other service assets, such as Air Force bombers, may provide sufficient overseas presence to mitigate the need for a 12-carrier force and thereby allow the Navy to achieve considerable budgetary savings without incurring unreasonable risks.

Plan to Add Limited Deep Strike
Capability to F-14s Is Questionable

The Navy plans to spend over $2 billion to add limited deep strike capability to 210 F-14A/B/D aircraft. The upgrade will give the aircraft a (1) limited ground attack capability to include a laser forward-looking infrared targeting system to more precisely locate and attack targets with laser-guided smart bombs; (2) modified cockpit systems to enable the use of night vision devices; and (3) improvements to the defensive electronics countermeasure system. Based on our work to date, it is questionable as to whether the Navy should proceed with it for the following reasons:

-- With the exception of 54 F-14Ds, the upgraded F-14s will not be as capable as the Navy's F/A-18C and A-6E aircraft or the Air

Force's F-15E aircraft.[3] None of the modified F-14s will have stand-off weapons capabilities like the F/A-18C aircraft.

-- Upgraded F-14s will not be available to fill a 2-year capability gap between the last A-6E retirement scheduled for 1997 and the introduction of the modified F-14s scheduled for 1999. At least one aircraft carrier is scheduled to deploy without A-6Es or upgraded F-14s later this year.

-- According to the Secretary of the Navy, 85 percent of the Navy's potential targets are within 200 miles of shore, within the range of existing F/A-18C aircraft.

-- There are other ways of reaching targets beyond the 200 miles. For example, Tomahawk cruise missiles, with a range of over 650 miles, can strike strategic targets at night, in adverse weather, or in heavy air defenses. Other aircraft such as Air Force bombers could also strike these distant targets.

On table 4, we compare the F-14A/D aircraft capabilities with those of other selected deep strike aircraft.

---

[3]The A-6E is being retired from the force.

Table 4: Selected Comparison of A-6E, F/A-18C, F-14 Block I, and F-15E Capabilities

Capability	A-6E	F/A-18C	Aircraft Block I F-14A	F-14D	F-15E
Air-to-ground					
All- Weather					
Ground mapping radar	●	●		●	●
Target FLIR	●	●	●	●	●
Navigation FLIR		●			●
Terrain avoidance	●	●			●
Targeting laser	●	●	●	●	●
Moving map display		●			
Radar reconnaissance		●			
Photo reconnaissance			●	●	
Precision-guided stand-off weapons					
Air-to-ground					
Laser-guided bombs	●	●	●	●	●
HARM	●	●			
Harpoon	●	●			
Maverick	●	●			●
SLAM	●	●			
Walleye	●	●			
JDAM/JSOW		●			●

We note the interest of the House and Senate Armed Services Committees in directing the Navy to maintain some deep strike capability aboard its carriers during the interim between the retirement of the A-6E aircraft and development of a new strike aircraft. The Committees directed the Navy to modify at least 54 F-14D aircraft to provide a ground strike capability similar to the Air Force's F-15E. The Navy is not seriously considering adding F-15E capabilities to its F-14s because the Navy believes it will be too expensive. To add F-15E capabilities to the F-14, the Navy believes that it will cost considerably more than the $2 billion upgrade.

SAVINGS MAY BE POSSIBLE IF NUCLEAR SHIP CONSTRUCTION DECISIONS ARE CHANGED

The Navy wants to build a new nuclear aircraft carrier (CVN-76) in fiscal year 1995, and a third Seawolf submarine in fiscal year 1996 primarily to support the nuclear shipbuilding industrial base at two shipyards. In the Bottom-Up Review, DOD considered consolidating nuclear work at a single shipyard and found that substantial costs could be saved, but it rejected this option.

DOD and the Navy have not provided information needed to judge the overall cost/benefit implications of moving to nuclear shipyard consolidation. DOD has not identified which critical vendors and skills would be lost, the cost of reconstituting those vendors and skills, or alternative ways of preserving them. DOD has also not explained how nuclear work currently conducted by the public shipyards would be managed under this option. Without these industrial base assessments it is difficult to determine the optimum approach to achieve the Navy's force and modernization objectives in the most cost effective manner.

Bottom-Up Review Rejects Shipyard Consolidation

In the Bottom-Up Review, DOD examined the potential budgetary savings and other implications of consolidating nuclear carrier and submarine construction at a single shipyard. It recognized that reduced procurement rates had resulted in excess production capacity at the shipyards. Under one consolidation scenario, DOD reported that $1.8 billion would be saved during the period 1995 through 1999 if all nuclear construction was done at one shipyard. Under another consolidation scenario, DOD concluded that CVN-76 could be delayed until fiscal year 2000 and the risk to the industrial base could be mitigated if certain actions were taken--such as a "smart shutdown" of certain carrier construction capabilities combined with rescheduling delivery of carriers under contract, overhauls, and other work like a new nuclear attack submarine. In the Bottom-Up Review, DOD rejected the consolidation option because it was concerned about the resulting loss of competition as well as other long-term defense industrial base and national security needs. Because DOD has not provided the basis for its position it is not clear what it meant by "loss of competition". Only one shipyard currently builds nuclear aircraft carriers and DOD has directed future nuclear submarine work to be done at the other nuclear shipyard.

It is also unclear on what basis DOD determined that two nuclear shipyards were needed to protect "the long term defense industrial base and national security".

Alternative Nuclear Shipbuilding Strategies Could Achieve Budgetary Savings

We have analyzed several carrier force structure options to building CVN-76 in fiscal year 1995. We compared the cost of deferring carrier construction until 1998 or 2000 with the cost of building CVN-76 in fiscal year 1995 as currently planned by the Navy. As shown in table 5, budget authority is about the same from 1995 to 1999 whether the CVN-76 is built in 1995 or 1998. But budget outlays would be about $1.7 billion less if CVN-76 were built in 1998 versus 1995. Both budget authority and outlays would be less during this period if CVN-76 were deferred to the year 2000.

Table 5: Nuclear Carrier Force Structure Investment Options

Fiscal year 1995 dollars in billions

	Budget Authority			Outlays		
Carrier Acquisition Strategy Option	**FY95-99**	**FY95-15**	**FY95-35**	**FY95-99**	**FY95-15**	**FY95-35**
Bottom-Up Review - Buys CVN-76 in FY-95	$5.8	$32.6	$65.8	$4.4	$27.2	$58.7
Defer CVN-76 until FY-98	$6.3	$29.7	$60.7	$2.8	$26.7	$57.1
Defer CVN-76 until FY-00	$2.0	$30.4	$61.4	$2.0	$27.7	$56.8

If building CVN-76 is deferred to either 1998 or 2000, it may be necessary to schedule other work at Newport News Shipyard such as overhauls or refuelings in order to maintain critical skills. On the other hand if a decision is made to consolidate all nuclear work at one shipyard, nuclear submarine construction could help mitigate the loss of critical skills.

We have also analyzed acquisition options for attack submarines. Our analysis shows that for force structure purposes the Navy would not need to begin to build any new submarines until sometime after the turn of the century. Therefore, one scenario under the consolidated shipyard approach could be for the Navy to begin building CVN-76 in 1995 as planned and not build the third Seawolf submarine.

These cost savings options need to be judged along with the critical industrial base information. We believe Congress should ask DOD and the Navy to provide this information.

Building Conventional Carriers Is Considerably Less Expensive Than Building Nuclear Carriers

Congress has recently directed us to evaluate the cost-effectiveness of conventional versus nuclear carriers and submarines. As part of this evaluation we have been asked to evaluate the total cost to acquire, operate, support, and dispose of these ships. This audit will start soon.

Our preliminary analysis shows that it is considerably less expensive to acquire conventional carriers compared with acquiring nuclear carriers. This analysis did not include any operational related issues. Table 6 shows that if the Navy were to buy CVN-76 in 1995 as planned and then begin to acquire conventional carriers, considerable savings could be achieved in the years beyond 1999.

Table 6: Conventional Carrier Force Structure Investment Options

Fiscal year 1995 dollars in billions

	Budget Authority			Outlays		
Carrier Acquisition Strategy Option	**FY95-99**	**FY95-15**	**FY95-35**	**FY95-99**	**FY95-15**	**FY95-35**
Bottom-Up Review - Buys CVN-76 in FY-95	$5.8	$32.6	$65.8	$4.4	$27.2	$58.7
Buys CVN-76 in FY-95 But Transitions to a Conventional Carrier Construction Program with CVA-77	$5.3	$23.6	$42.9	$4.4	$20.7	$43.6
Replaces All Carriers at Retirement with Conventional Carriers	$2.2	$20.3	$37.0	$1.6	$18.3	$35.6

\- - - -

Mr. Chairman, this concludes my prepared remarks. I would be glad to answer any questions from you or Members of the Subcommittee.

RELATED GAO REPORTS

DOD Budget: Evaluation of Defense Science Board Report on Funding Shortfalls (GAO/NSIAD-94-139, Apr. 20, 1994).

Navy Aviation: V-22 Development--Schedule Extended, Performance Reduced, and Costs Increased (GAO/NSIAD-94-44, Jan. 13, 1994).

Navy Contract: AOE 6 Shipbuilding Claims Settled But More Delays and Cost Growth Likely (GAO/NSIAD-93-298, Sept. 30, 1993).

Navy Ships: Problems Continue to Plague the Seawolf Submarine Program (GAO/NSIAD-93-171, Aug. 4, 1993).

Navy Carrier Battle Groups: The Structure and Affordability of the Future Force (GAO/NSIAD-93-74, Feb. 25, 1993).

Weapons Acquisition: A Rare Opportunity for Lasting Change (GAO/NSIAD-93-15, December 1992).

Navy Contracting: Cost Growth Continues On Ship Construction Contracts (GAO/NSIAD-92-218, Aug. 31, 1992).

(701038)

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 6015
Gaithersburg, MD 20884-6015

or visit:

Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000
or by using fax number (301) 258-4066.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (301) 258-4097 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

Document Separator

Document Separator

CRM 94-172 / October 1994

Downsizing the Defense Industrial Base and Implications for U.S. Shipbuilding

Jonathan W. Leland

Center for Naval Analyses
4401 Ford Avenue • Alexandria, Virginia 22302-1498

Approved for distribution: October 1994

Samuel D. Kleinman, Director
Infrastructure Program
Acquisition and Support Division

Contents

Summary

With less money being spent on defense, the defense industrial base must shrink. Given the importance of the base to U.S. security, there is understandable concern that unfettered market processes will fail to produce an outcome in the best interest of the nation. As a consequence, there is sometimes an overwhelming urge to attempt to engineer the downsizing process.

In this paper, we consider aspects of the supply and demand sides of defense markets which favor an efficient, market-produced downsizing and those conditions which might call for intervention. The analysis is conducted first at the prime contractor level (aerospace and shipbuilding) and then at the defense subcontractor level (treated generically). In regard to aerospace, the analysis suggests that features of the military's preferences for aircraft (the demand side) and the structure of the industry (the supply side) are likely to make intervention unnecessary.

Along similar lines, the analysis of the subcontractor market suggests that the case for intervening at that level must not be overstated. Although hard data are lacking regarding the structure of the vendor base and the downsizing process within it, there are good reasons to believe that the incentives of firms at the prime and subcontractor levels will result in a downsizing process that preserves production capability.

Because of the emphasis placed on timeliness and economy in the acquisition of ships and the idiosyncratic structure of the shipbuilding industry, the analysis of shipbuilding proves less clear-cut. At least for now, policy options in this industry vary by type of vessel.

For nuclear carriers, there is only one supplier. If carriers are desired, they will have to be produced at Newport News Shipbuilding (NNS), at least for the foreseeable future.

In submarine construction, there are two suppliers. A hiatus in production is not likely to eliminate both. On the other hand, the option of having competition for submarine construction at some future date may vanish if one of the suppliers exits. Whether the costs necessary to prevent this are worth the benefits of preserving the possibility of future competition is an open question.

Markets for combatants and for assault and amphibious ships are potentially thicker than those for carriers or submarines. This in itself favors letting market forces dictate the downsizing process in this sector. Unfortunately, there is no way to ensure that shipyards that win competitive awards in the near term will necessarily be those whose survival ensures the greatest overall production capability in the long run. However, the alternative policy of allocating construction to preserve currently active firms runs the risk of producing a shipbuilding industrial base which, though larger in terms of the number of firms, is less capable and vital due to the relative weakness of those firms. How these different perils should be traded off is clearly a matter of judgment and a potential source of future study.

Introduction

Reduced expenditures on naval weapons platforms require that the U.S. shipbuilding and aerospace sectors shrink. This raises concern that production capabilities critical to national defense will be lost. A natural response to such concerns is to attempt to engineer the downsizing process through intervention by the Department of the Navy (DON). In shipbuilding, for example, intervention might involve assigning rather than competing ship construction. At the level of defense subcontractors, vital but failing firms might be subsidized.

The issue of appropriate DON policy regarding shipbuilding and aircraft mirrors, on a lesser scale, identical issues faced by the Department of Defense (DOD). To date, DOD has, with obvious exceptions,[1] played a noninterventionist role in the downsizing process. Instead, market forces are being relied on to ensure short-term support for planned contingencies and appropriate response to future threats. This reliance on the market process and the lack of an industrial base policy has been widely criticized in defense, academic, business, and policy circles [1 through 4]. Pundits in each camp argue that market participants are poorly motivated and the market mechanism is ill-suited to make decisions in the best interest of the country. As such, the government should take an active role in shaping and preserving defense capabilities through intervention in the downsizing of prime contractor markets and/or protection of members of the defense subcontractor base.

Section I of this paper reviews these arguments and suggests that they are either not compelling or incomplete. Section II proposes analyzing the downsizing process and the merits and disadvantages of intervention from a *declining industries* perspective. Decreases in demand

1. An obvious exception is the Pentagon's policy of passing back part of the cost savings of weapons acquisition anticipated through a merger, to defense contractors involved in the merger.

for an industry's product require reductions in productive capacity through exit and/or consolidation. Whether this process is orderly and efficient depends on the set of strategies firms within the industry pursue. If all attempt to remain in the industry, downsizing will be arduous. Conversely, if stronger firms pursue stay strategies while the weaker exit, the transition to a new smaller industrial structure will be smooth, and capability will be retained.

In weapons production, decisions by firms regarding whether to stay in the industry, consolidate, or withdraw are shaped by two primary factors:

- The structure of the industry at the time of a drawdown and the firm's competitive position at that moment
- The military's preferences regarding what is important in an acquisition (e.g., performance innovations versus timeliness in delivery) and how procurement vehicles are selected to satisfy these preferences.

Section III analyzes the prospects for efficient downsizing and the wisdom of intervention in aerospace. Features of the market structure in aerospace, the nature of the military's preferences for the platforms they provide, and the procurement methods used to satisfy these preferences all promote orderly downsizing in this sector. Intervention here is clearly not warranted.

Section IV applies a similar approach to shipbuilding. This analysis shows first that the historical evolution of the shipbuilding base has been significantly shaped by the way timeliness in acquisition has vied with economy in acquisition over time. The result is a market structure that is very thin for nuclear vessels and broader for nonnuclear ones. Policy options regarding nuclear vessels are limited by the thinness of those markets. For nonnuclear vessels, the options are greater and again involve the tradeoff between timeliness and economy in acquisition. Timeliness in acquisition, in particular acquisitions at some date in the future, favors spreading Navy work across existing producers. So doing preserves the present shipbuilding base. Economy, on the other hand, favors competitive awards for shipbuilding but doing so is likely to result in exits from the shipbuilding base.

Because neither policy is clearly preferable, we will discuss the pros and cons of each.

Section V analyzes a related concern regarding the defense industrial base—that capabilities and production capacity at the subcontractor level are declining to unacceptably low levels. This issue proves difficult to decide either way because there are so little data on the size of the vendor base over time. Partly because there is so little evidence, studies of this issue tend to involve counts of current vendors whose existence is threatened by reductions in Navy and DOD expenditures. These studies are of great use in identifying potential bottlenecks in weapons production and candidates who might need assistance. However, we point out in section V that the use of such counts to infer that the vendor base is shrinking "inappropriately" is problematic and may grossly overstate the degree to which production capabilities critical to defense are declining.

Arguments for intervention—motivation and market structure problems

There are two primary arguments put forth to justify government intervention in the downsizing of the defense infrastructure—one deals with incentives and the other with market structure. The incentives argument is reflected in the following quote from Norman Augustine, then Chairman of Martin-Marietta, in an address to the American Bar Association:

> The U.S. government cannot simply step back from the fray {of downsizing the defense infrastructure} and let the forces of the free-enterprise system solve the problem for it [5].

Augustine bases this call for intervention on the claim that decision-makers in private industry have neither the obligation nor the incentive to preserve an adequate industrial base. Such claims are not, however, entirely compelling. These same decision-makers presumably had neither the obligation nor the incentive to produce the industrial base of the Cold War—a war we won and won over a system in which the incentives were much different and the base much more centrally controlled.

It is tempting to write off Augustine's claims as simple parochialism. Clearly if DOD, in efforts to force an orderly downsizing, picked winners, and picked Martin-Marietta (or now, perhaps, Martin-Lockheed) as one of them, Augustine would be a happy man and life would be simple. There is, however, another more compelling interpretation of his call for government intervention and one that applies to decision-makers involved in the downsizing process across the board. Notwithstanding the fall of the Soviet Union, the world remains a dangerous place and one which is, in many respects, harder to plan for. The identity of future threats is unknown. So too are the types of technologies and weapons systems that will best counter these threats.

This type of uncertainty increases the challenges facing decision-makers in the defense industry as well as those within the military. At the same time, substantial budget reductions are making the consequences of bad decisions on the part of industrialists much more dire. Given these circumstances, it is natural and understandable that industry leaders would prefer more constraints on the set of decisions they face. Such constraints make the problems they face more tractable and reduce the risk to which their firms are, individually, exposed. Nevertheless, from the perspective of the system—the eventual structure of the industrial base—the solution reached through the interaction among firms is apt to be better if the environment is left unconstrained than if the decisions are made subject to what may be arbitrarily imposed constraints on the choice of technologies to pursue, systems to develop, and the like. Markets operate very effectively as mechanisms for eliciting informed opinions regarding the allocation and reallocation of resources under uncertainty. Moreover, this is so, in large part, because the motives of those in the market are self-serving.

Many would object that the claim that the market-based allocation of resources will be preferable to one achieved under constraint presupposes competitive market conditions clearly violated in the defense industry. As emphasized by Scherer [6] in his seminal study of the acquisition process, the defense industry, at the level of the prime contractors, is anything but a standard competitive market. On the contrary, the market for provision of defense platforms is characterized by firms that:

- All cater to a single buyer
- Produce and compete in relatively thin markets
- Specialize in large-scale one- or few-of-a-kind systems' integration and focus on product quality and capabilities, largely ignoring price.

Given these characteristics, the efficiency of allocations achieved in such a market is open to question.

Gansler [4, 7, 8] takes this observation further, arguing that these features of markets for defense imply that a laissez-faire approach to downsizing "will not generate an efficient or effective outcome."[2] Instead he argues that in defense "Each case is a 'special case' and actions must be evaluated on their own merits rather than on the basis of any universal theory." Accepting that markets for large defense systems are special cases, however, it does not necessarily follow that they are all cases in which downsizing will be mishandled in the absence of intervention by the government. Instead, one must identify which features are conducive to efficient downsizing, which are not, and where the markets for weapons platforms fit into these characterizations. Research on the behavior of mature and declining industries proves useful in this regard.

---

2. More specifically, Gansler [7] notes a result by Lipsey and Lanchaster [9] demonstrating that, starting from a situation in which certain conditions for competitive equilibrium don't hold, ensuring that a subset of these conditions subsequently do, does not necessarily move the market solution closer to optimality. He goes on to argue that this "theorem of the second best" implies failure of the laissez-faire approach to downsizing. Although technically correct, Gansler's invocation of the theorem of the second best would invalidate the role of competitive analysis in any market context. All markets, defense and nondefense, foreign as well as domestic, are connected. In the language of economic theory, they collectively constitute a system striving toward a "general equilibrium." In this context, the theorem of the second best implies that even markets within the system which appear to satisfy the conditions for efficient allocation—the market for wheat, for example—must still be treated as special cases because other, even distantly connected markets like those for large defense systems, fail to satisfy requirements for an efficient allocation.

Downsizing among prime contractors—A strategic perspective

Harrigan [10, 11] has conducted extensive studies of the process whereby industries transit from a stage of growth in output to one of maturity and subsequent decline. Harrigan and Porter [12] discuss this process in terms of the types of strategies individual firms in such a market environment might choose to pursue. They identify four basic responses to market decline:

- Leadership—establish a position of dominance within the new small market structure. This process is expedited by:
  - Ensuring that other, less healthy firms exit in a timely fashion, often by acquiring them at attractive prices
  - Disclosure of information that makes clear the inevitability of market decline and the firm's comparative advantage in surviving the downturn
  - Raising the stakes to others pursuing "stay" strategies by making investments in process and product which increase the costs of staying for other firms.
- Niche—select a relatively stable segment of the declining industry, commit additional resources to this segment, and divest from the remaining segments of the industry.
- Harvest—gradually divest from the industry drawing as much cash flow out as is possible through reduced investment, labor force, product quality, and timeliness of provision. Eventually liquidate.
- Quick divestment—sell the company in the early stages of the decline at relatively advantageous prices.

Which strategy a firm chooses to pursue depends, to large extent, upon three factors: the nature of demand for the product, the characteristics associated with production of the product, and the structure of the market. A firm is more likely to pursue exit if the decline in demand is believed to be permanent than if future prospects for the industry are uncertain. Characteristics of the production process influence strategy choice through their influence on the costs and benefits of exit. Firms with significant investment in specialized capital (of little value in its next best use), for example, will be more predisposed to pursue stay strategies than if assets are readily saleable. Finally, strategy selection is influenced by the structure of the market. Markets containing a relatively small number of equals may be more likely to elicit stay strategies than ones with a more heterogenous structure in terms of the size and financial resources of firms.

How the process of downsizing plays out depends, of course, not on the strategy pursued by a single firm but on the interplay of strategies pursued by members of the industry as a whole. Orderliness of the downsizing process occurs as a result of a complementary meshing of strategies that firms within the market select. If those in a stronger market position choose stay strategies while those in weaker positions pursue exit strategies, downsizing will tend to be efficient. Moreover, it will tend to be capability preserving to the extent that unique and valuable assets of weaker firms will flow to the stronger.

Absent such complementary strategies, however, the downsizing process can be arduous. Jensen [13] cites the pattern of downsizing in the tire industry as a case in point. Due largely to technological improvements in tires, in particular to the introduction of more durable radial designs over bias-ply tires, the tire industry in the 1980s had substantial excess production capacity. Unfortunately, firms within the industry tended toward aggressive stay strategies, and as a result, the downsizing within the industry was delayed and costly.

This discussion suggests that for the purposes of evaluating downsizing in defense, understanding why the process observed may differ between industries within the defense sector, and what such differences in behavior imply regarding policy, we must understand three things:

- The characteristics of their production processes
- The nature of demand for platforms—the structure of the military's preferences for platforms
- The structure of the industries producing ships and aircraft.

It is to these issues that we now turn, first with respect to aerospace and then with respect to shipbuilding.

Aerospace—A model of efficient downsizing

As noted above, the strategies firms within a given defense sector will select depend, in part, on the preferences of the buyers—DOD and the branches of the military. As a first approximation, we can think of the military's preferences regarding weapons platforms such as aircraft and ships or systems such as missiles as being defined on three dimensions:

- Performance
- Timeliness of provision
- Economy.

On each of these dimensions, all else being equal, the military would prefer more—a faster or more maneuverable aircraft, more destroyers per year than less, and either at a lower rather than a higher cost per unit. The relative importance of each attribute, however, differs among ships, submarines, and aircraft in accordance with the different ways these assets contribute to warfighting capability.

Quantity of payload per unit of time provides a crude measure of warfighting capability. As illustrated in table 1, aircraft, ships, and submarines each represent different compromises in the realization of this capability.[3] Aircraft carry only small payloads but are very fast and maneuverable in their delivery. Submarines carry intermediate payloads in a slow but stealthy fashion. Finally, ships carry large payloads but require time to reach their station. There is also a significant difference between aircraft and seacraft on the production side. Aircraft, once designed, can be produced on a production line at very high rates. This is much less the case for ships which, at least traditionally, have been built from the keel up.

3. I am indebted to Vice Admiral William Rowden (ret.) for proposing this characterization of the differences between weapons platforms.

Table 1. Differing characteristics of weapons platforms

	Aircraft	Submarines	Ships
Payload	Small	Medium	Large
Speed	Fast and maneuverable	Slow but stealthy	Slow
Production rate	High	Low	Low

As a result of these differences, the relative importance of performance, timeliness of provision, and economy differs across platforms. For aircraft, an almost absolute premium is placed on performance characteristics over economy, with timeliness—given the nature of the production process—running third in the hierarchy. Not surprisingly, this ranking is reflected in the method of procurement usually employed in aerospace—competition in the design phase of projects and then sole-source award of the production contract to the winning firm.[4] This practice is commonly criticized as leading firms to "buy in" on design in the hopes that they will be able to "get well" by exerting monopoly power in production [14]. This may well be, but it is beside the point—if a true premium is placed on advances in performance, this procurement method, which in essence constitutes a tournament, is well-suited [15, 16].

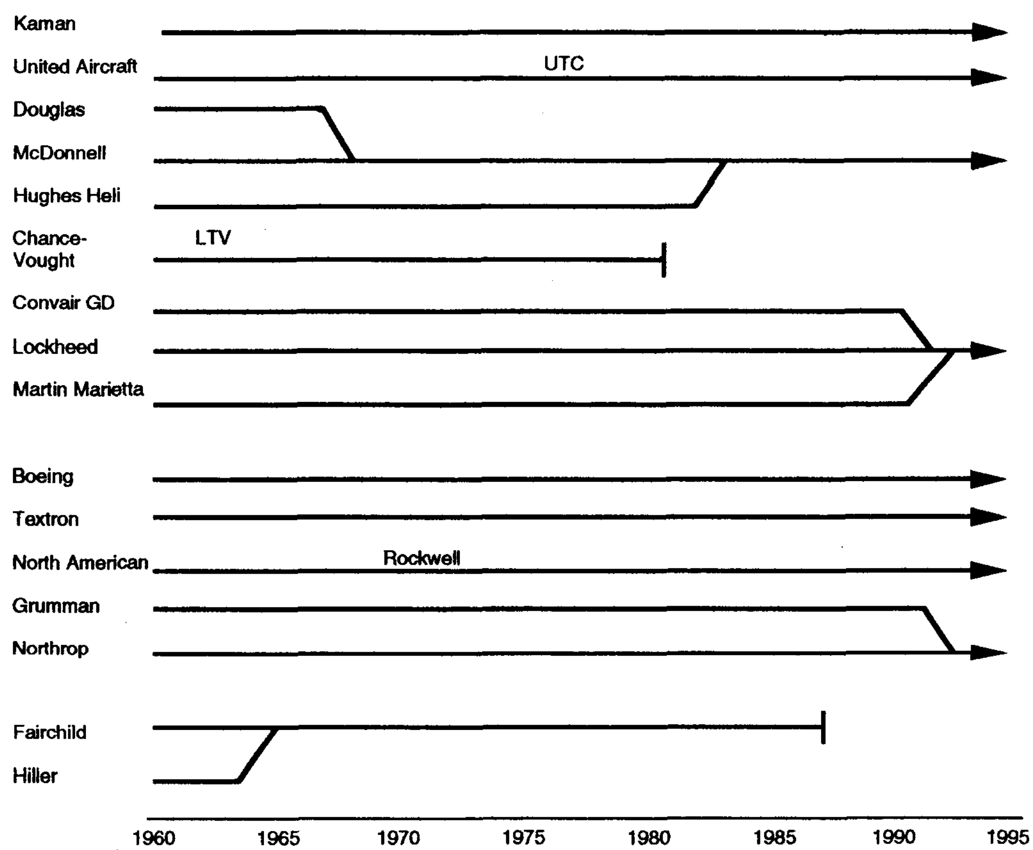
As a result of these long-term and sole-source contracts, the relative strength of aerospace companies heading into the downturn was universally apparent. In the game of defense musical chairs, it was clear upon the fall of the Soviet Union who had seats at the table and who was left standing. The downsizing that followed has been quite rapid as indicated in table 2, which summarizes some of the recent activity among prime defense contractors, and in table 3, which shows the historical pattern of consolidation in aerospace over time. Moreover, the process has been remarkably smooth with bidding wars for acquisition avoided even in cases where they were widely anticipated as between Northrop and Martin-Marietta over the acquisition of Grumman.

4. There are, however, exceptions to this rule. The B1 bomber, for example, was awarded on a noncompetitive basis.

Table 2. Strategies in declining industries

Stay		Exit
Leadership/niche	versus (examples)	Harvest/quick divestment
Loral Carlyle Group (missiles)	buys	LTV Corp missile division
Lockheed (aircraft)	buys	GD fighter plane division
Northrop (aircraft)	buys	Grumman

Table 3. Downsizing in aerospace



*(adapted from Booze, Allen, Hamilton)

Somewhat surprisingly, many of the reasons for such orderliness are precisely those cited to suggest that a laissez-faire approach to downsizing won't work. That the number of primes is relatively small contributes to a consensus understanding of the capabilities of each. Consistent with the aforementioned literature on strategy, many of those with chairs have moved—through acquisition of financially weaker firms and through acquisition and divestment at the division level among strong firms—to fill defense niches that build upon their strengths. Other firms, such as Martin Marietta and Lockheed, appear to be pursuing leadership positions that are more broadly defined. Finally, there are firms actively pursuing harvest strategies. General Dynamics is an example. Through such means, economies of scale are re-established through consolidation, higher valued assets within the market are retained, and less valuable ones released.

To summarize, the fact that in the acquisition of aircraft and related weapons DOD places a clear priority upon performance, that purchases thus tend to be large and sole-source, and that the market itself is thin and interconnected, all contribute to an orderly downsizing process.

A possible risk in this process is that as the number of firms left to compete for given classes of weapons systems dwindles, collusion could occur; or, in the extreme, a monopoly could result. However, there are several points to remember here. First, as pointed out by Scherer [6], collusion among defense primes has not been a problem in the past. Second, as also pointed out by Scherer, competition in defense, leastways performance competition, may be best served if the number of competitors is small—with too many competitors, the probability of award gets too low to justify substantial investments in innovation. Third, remember that even in the case of a single supplier, the market structure is generally not one of pure monopoly but one of bi-lateral monopoly—the supplier, absent a large nondefense contract base, is as dependent on the government as the government is on the seller. Moreover, the government is a buyer with unparalleled financial power and legal authority—authority that is particularly easy to wield when the motivation is national security interests. Finally, if all else were equal, it might be preferable to maintain thicker rather than thinner markets for military systems; however, thicker markets entail excess capacity—capacity that the consolidation activities summarized in table 2 aim to rationalize.

What's wrong with shipbuilding?

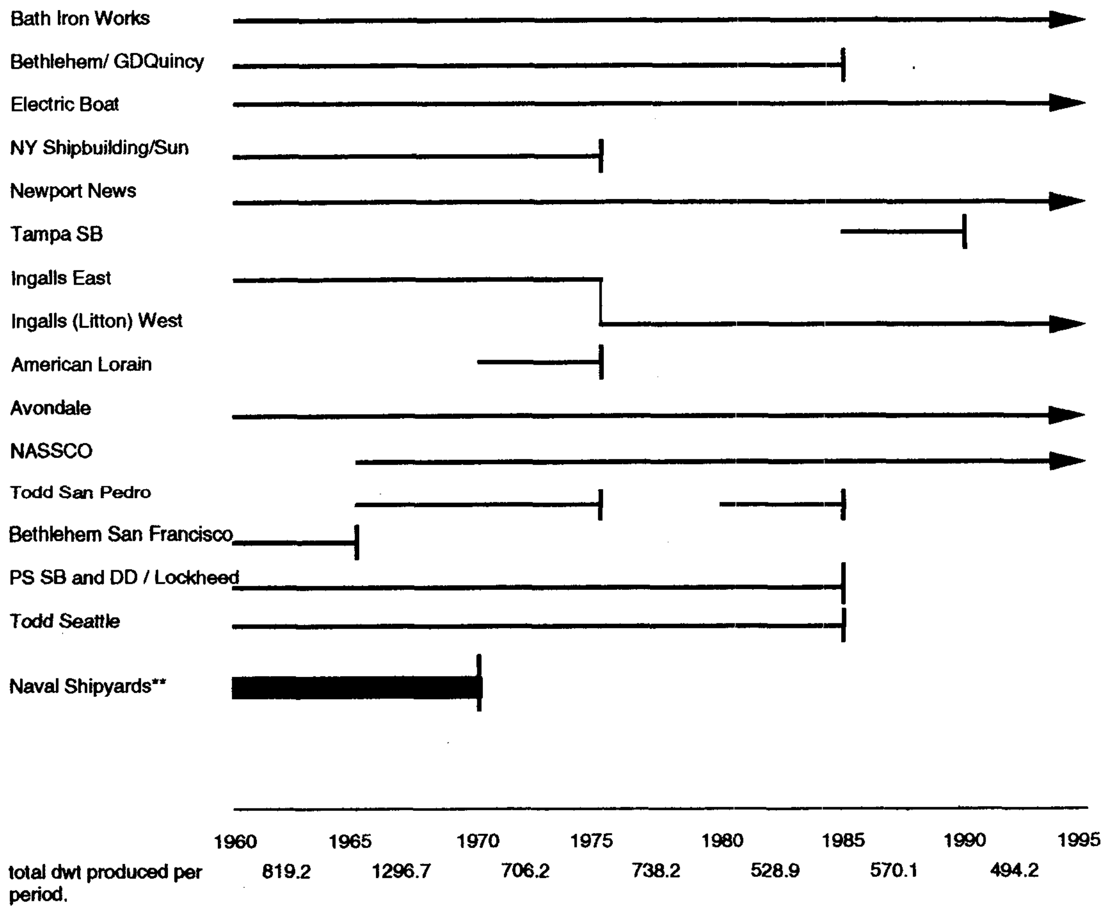
The aerospace industry has exhibited a gradual trend toward concentration through consolidation of firms over time—a process accelerated by the fall of the Soviet Union and subsequent reductions in current and anticipated defense expenditures. The situation in shipbuilding is much different. Among the list of defense prime contractors shown in table 2, shipbuilders are notable in their absence. Missile makers, aircraft manufacturers, and the like have merged and consolidated since the fall of the Soviet Union, but there has been no such activity in the shipbuilding industry. Instead, the list of currently active producers of major Navy vessels, shown in table 4, has remained stable since 1985. Moreover, the historical path of the shipbuilding industry illustrated in table 5 appears much different from that of aerospace. Downsizing in the shipbuilding is much more punctuated and occurs through exit rather than through merger.

Table 4. The shipbuilding base for major naval vessels[a]

Carriers	Submarines	Combatants	Amphibious	Large auxiliary
Newport News (225.2)[b]*	**Electric Boat/GD** (109.9)	**Litton/Ingalls** (236)	**Avondale** (255.9)	**NASCCO** (122.9)
	Newport News	**Bath** (92.5)	**Litton/Ingalls**	**Avondale**
		Newport News	*Newport News*	*Newport News*
			NASCCO	*Litton/Ingalls*
				Bath

a. Active producers by ship category are in bold; potential competitors, by ship category, are in italics.
b. Numbers denote maximum dwt ever produced in the shipyard during five-year periods 1960-64, 1965-69, ... to present.

Table 5. Evolution in naval shipbuilding



**Naval Shipyards
Portsmith NSY
NY NSY
Phila. NSY
SF NSY
MI NSY
PS NSY

(compiled from Jane' Fighting Ships)

The marked differences between the recent evolution of the shipbuilding and aerospace industries, as well as the difference in behavior in these industries since the fall of the USSR are, on the one hand, puzzling. Shipbuilders, like other defense prime contractors, have traditionally catered to a single customer, the Navy. The market for producing Navy ships, like those for other weapons systems, is thin. Finally, as with other types of systems, naval construction focuses on highly specialized designs with the emphasis on quality and capabilities over cost.

There are, however, major differences in the relative priority placed upon timeliness and economy over performance in the acquisition of ships versus aircraft. These differences, coupled with features of the production process in shipbuilding, help explain why downsizing occurs through exit rather than merger. Variation in the relative priority placed upon timeliness and economy also explains why concentration of the industry over time has occurred in an episodic rather than a gradual fashion. Both are discussed in the following section.

How we got here

Preferences for weapons systems can be defined by three primary attributes—performance, timeliness, and economy. As discussed in section III, aircraft provide warfighting capability in small packages that are fast and maneuverable. As a consequence, aircraft acquisition has traditionally been driven by the desire to obtain performance. Ships, in contrast, provide very large payloads but are slow. As a consequence, less emphasis has been placed on advances in the ship performance and more emphasis has been placed on the timeliness with which large quantities of ships could be acquired or the economy with which they could be acquired.

Timeliness in the acquisition of ships has traditionally been accomplished by awarding production of a given ship type across two or more shipyards. To do so, the design had to be standardized. This has been accomplished by soliciting designs from naval architects and then soliciting bids for construction from shipyards. As a result, shipyards tend to have small design and engineering staffs, particularly in comparison with aerospace firms where design and production are bundled together. The absence of large design staffs at shipyards limits the gains to be achieved through their merger. This fact, coupled with the fact that shipbuilding facilities are both more specialized and have fewer alternative uses than manufacturing facilities in aerospace explain why downsizing in shipbuilding occurs through exit rather than consolidation.

The importance placed on timeliness and economy in the procurement of ships and, in particular, how priorities placed on these attributes have varied over time, goes a long way toward explaining the pattern of downsizing in shipbuilding from 1960 to the present. As shown in table 5, the active building industry for Navy ships in the 1960s was quite large. Construction on certain types of ships and submarines was at times split between as many as five different construction yards. To a large extent, the size of the production base in this period was a consequence of the Navy's preference for timeliness in provision through the 1950s and early 1960s—a preference driven by the block obsolescence of the fleet occurring during that period.

A huge shake-out occurs in the industry beginning in the late 1960s and continuing into the 1970s. In the period between 1965 and 1970, 17 shipbuilders were producing major Navy vessels. During the next five-year period, the 6 naval shipyards withdrew from construction, leaving only 12 shipbuilders. (American Lorain entered during this period.) This drop in the number of producing shipyards was caused by two factors: a major drop in dollar awards to shipbuilders after 1967 and a concurrent increase in emphasis on economy over timeliness in acquisition [17].

The withdrawal of Navy shipyards from the construction of new ships was largely precipitated by an Ernst & Ernst study, which concluded that private shipyards constructed ships at significantly lower cost than public ones, a conclusion later reached in a DON study as well [17]. The exit of the public shipyards coupled with Ingalls' withdrawal from nuclear construction in the late 1970s combined to place Newport News Shipbuilding (NNS) as the sole and, as a practical matter, the only source of nuclear carriers—a situation which still applies today.

The withdrawal of the public shipyards might have produced a similar result for Electric Boat in submarine production had Admiral Rickover not encouraged Newport News Shipbuilding to compete in the design of the SSN-688. NNS won the contract to build the lead SSN-688 with Electric Boat designated as the follow-on shipyard. However, in contrast to past practice and consistent with the emphasis on economy in the late 1960s and early 1970s, production awards to both NNS and to Electric Boat were on a fixed-price as opposed to cost plus basis [17].

The emphasis on economy in procurement during the late 1960s and early 1970s is illustrated even more clearly by the use of total-package-procurement (TPP) contracts for production of the LHA class amphibious assault ships and the DD 963 class destroyers—both awarded to Litton Ingalls. With total-package-procurement, shipyards competed for the right to design and build the entire line of a given type of ship all at a fixed price per unit.

To summarize, the shake-out in shipbuilding between the 1960s and 1970s was largely precipitated by a change in emphasis on the part of DOD and the Navy from timeliness in provision to economy in provision. This resulted in the withdrawal of public shipyards from production. Among the remaining producers, economies were to be achieved through the use of fixed-price and TPP contracts. The justification for believing that such contracts would provide more economical provision was not entirely unreasonable. The incentives for cost reduction provided for by fixed-price over cost-plus type arrangements are well understood. Total-package-procurement offered still more benefits. Bundling design with production provided incentives to tightly tailor design and manufacture to the capabilities of the shipyard. Awarding entire production runs allows any economies of scale to be realized while at the same time providing incentives for the type of capital investments that are only cost-effective at high output levels.

These theoretical virtues of fixed-price and TTP vehicles notwithstanding, the contracts with Electric Boat, Newport News Shipbuilding, and Litton Ingalls all ran over budget and over schedule, and led to protracted legal wrangling between the contractors and the Navy. Whether such hard contracting was really a failure is, in hindsight, hard to ascertain. In a cost-plus environment, there is often a less concrete and certainly a less public benchmark for measuring overruns. In this regard, Entoven and Smith [18] note that the 60-percent cost overruns on the C-5a, another total-package-procurement project, were not out of line with those common on defense acquisitions and are, in fact, modest relative to estimates of cost overruns incurred in the 1950s. (Interestingly, overruns on the DD-963 also amounted to about 60 percent.) In addition, cost-plus environments reduce antagonism between buyer and supplier.

In any case, there does appear to be a critical problem with the military's implementing competitive acquisition methods for weapons, namely, their inability to allow firms to fail. Three factors contribute to this inability.

First, the branches of the military are unable, not necessarily for inappropriate reasons, to accept a design and commit to it. Instead, changes in the design and construction occur throughout the production run. This provides a source of conflict between the buyer and the supplier as to who should pay for changes and how much.

Second, once the possibility of economic failure arises, the belief that significant regional unemployment will result makes allowing the firm to die politically unacceptable. The belief that a firm's failure will necessarily entail major unemployment, particularly for something the military wants and which is as immobile as a ship, is, to a certain extent, fallacious. It treats the firm's capabilities as dependent upon the existence of the firm itself which is not generally the case. Instead, if a firm failed because of fiscal mismanagement or overly optimistic bidding, its assets, including work in progress, would be bought out be someone else and production resumed. This outcome does not necessarily save the military any money because, to the extent that the original bid was too low, production will only resume after a renegotiation of price. Nevertheless, it would serve as a warning to other suppliers that the government was willing to punish firms for buying in.

There is, however, a third factor that makes it difficult for the government to enforce contracts. There comes a time when the relative priority placed upon economy over timeliness reverses, and when this occurs, the military can no longer play hardball—if it wants timely provision, it must accede. Indeed, timeliness of procurement was explicitly cited by the Navy as a reason for settling with Litton on the DD-963 [19].

By the mid-1970s, Navy policy regarding ship acquisitions had softened considerably. Contracts for the FFG-7 and for the CG-47 were split between shipyards—Bath and Todd in the former and Ingalls and Bath in the latter. One reason for this change was that timeliness replaced economy on the priority list [20]. Large numbers of frigates were needed to replace older surface combatants, some of which were of World War II vintage. Cruisers were needed as platforms for the AEGIS weapons system. In light of the problems encountered on the LHA, the DD-963, and the SSN-688, awards for the FFG-7 ships were of a cost-plus variety. On the CG-47, early construction was awarded on a cost-plus basis. Competition between Ingalls and Bath was planned for building follow-on ships, although due to problems at Bath, these appear not to have come about. During the same period, Electric Boat's position as the primary provider of submarines was cemented with the award for construction of the SSBN-726. This award was made on a fixed-price basis, although, at least at the time, it appeared extremely lucrative[5] [21].

During the 1980s, under the Reagan administration, the pendulum swung back toward competitive procurement on a price basis. Contracts for production of the LSD-49 and the AOE-6 were awarded competitively to Avondale and NAASCO, respectively, on a fixed-price basis, thus establishing their present positions as primary amphibious assault and auxiliary ship producers.

To summarize, much of the evolution of the shipbuilding industrial base can be understood in terms of how the priority placed on timeliness relative to economy in the acquisition of ships has varied over time. When the emphasis has been placed upon economy, the shipbuilding base has tended to thin and firms within it to specialize. Conversely, when timeliness has become important, the Navy has spread work across shipyards rather than favor those with larger facilities, thereby stabilizing the size of the industry.

5. Tyler [21] and Goodwin [17] discuss the extraordinary history behind the award and construction in both the SSN-688 and SBN-726 programs.

Policy options regarding shipbuilding—where do we go from here?

The result of the process described above is depicted in table 4—the current Navy active shipbuilding industrial base (in bold) consisting of one carrier producer, two submarine producers, two combatant producers, and one producer each for large amphibious and auxiliary ships. As a practical matter, the market as a whole is thicker than depicted as one moves from left to right as indicated by the "potential competitors" shown in italics in the table. NNS could produce, although not necessarily compete successfully, in the construction of combatant, amphibious, and auxiliary ships. Likewise Ingalls, and Bath subject to certain size constraints, could compete in the construction of amphibious and auxiliary ships. However, prospects for right-to-left competition are less likely and, as a practical matter, vanish for nuclear-propelled vessels.

Just as the timeliness-economy tradeoff has shaped this evolution, it is at the heart of current debates over appropriate policies regarding the shipbuilding industrial base. Reductions in current and planned expenditures for Navy vessels, the perception that threats to the United States have been greatly reduced, and the fact that the many current Navy assets are relatively young all favor placing a premium on economical acquisition. Competition to force prices down is favored on this dimension. Such competition will, however, produce exit. On the other hand, concern that one day we will want to produce more ships in a hurry—concern for timeliness—argues for acquisition strategies that preserve existing producers. This generally involves assigning work to different shipyards on a cost plus basis. We now consider the consequences of such policies as they apply to different segments of the shipbuilding sector. Because the industry structure differs for nuclear carriers and submarines, policy options regarding these are discussed separately.

Options regarding aircraft carriers

Newport News Shipbuilding has been the sole producer of aircraft carriers since the 1970s. This position was essentially solidified by three factors—the award of the design contract for the Nimitz-class carrier to NNS in 1962, the withdrawal of public shipyards (the only alternative producers with both the physical capacity and nuclear experience to produce the Nimitz class) in the 1970s, and the withdrawal of Ingalls from nuclear production in the late 1970s.

Absent major changes from the status quo, the issues of timeliness and economy are moot with regard to aircraft carriers. Stimulating future competition for nuclear carriers in the interest of reducing price would seem to require two significant changes from the status quo. First, it would require a smaller carrier, one that could be built at shipyards other than NNS. Second, it would require that the carrier either be nonnuclear, that the nuclear component be separately supplied with the competing shipyards providing designs for a ship built around a common propulsion system, or that another large shipyard become nuclear capable or acquire that capability presumably through teaming with Electric Boat. In any case, it is hard to imagine the market for carriers consisting of more than two competitors. On the other hand, the fact that, in the provision of carriers, the government and NNS have operated in a bi-lateral monopoly situation for so long, gives one pause regarding the often discussed perils of such markets.

Options regarding submarines

The market for submarines is only slightly thicker than that for aircraft carriers. Indeed, it is easy to imagine that had NNS not been enticed to enter the design competition for the SSN-688, Electric Boat might well be the sole designer, and perhaps the sole builder, of submarines today. In any case, the fact that there are two builders capable of nuclear submarine design and construction suggests that the primary impetus in the debate regarding submarine construction and, in particular, continued production of the SSN-21, is not the need to preserve submarine production capability. NNS is an alternative producer whose nuclear capabilities will be preserved through other work. Instead, it seems that the primary motivation behind continued production at Electric Boat, is to ensure price and design competition in the future. Whether this is the best or only way of achieving this objective is far from obvious. The specialized nature of Electric Boat's facilities and assets constitute significant exit barriers. Given any prospects for design and production opportunities in the future, General Dynamics may be loath to close Electric Boat any time soon, even under difficult circumstances. On the other hand, should they exit, re-establishing a nuclear facility would certainly be costly and could be difficult politically. The option of switching to nonnuclear propulsion—a legitimate possibility regarding aircraft carriers—is not as viable with regard to submarines. Finally, the exit of Electric Boat would place NNS in the position of being the sole producer of two of the Navy's primary assets.

Options regarding nonnuclear vessels

For surface, amphibious assault, and auxiliary ships, the number of actual and potential competitors is larger. Based on this fact, one might anticipate that industrial base and timeliness concerns would be secondary regarding such construction. However, preservation of the industrial base has figured prominently in discussions regarding the DDG-51. Bath was selected as the lead shipyard on the DDG-51 in 1985 with Litton/Ingalls chosen as a second source in 1987. Recently, bids were taken for FY 1994 and FY 1995 construction [22]. However, after reviewing these bids, the Navy chose to split production between shipyards. Both splits and competition in such cases have pros and cons.

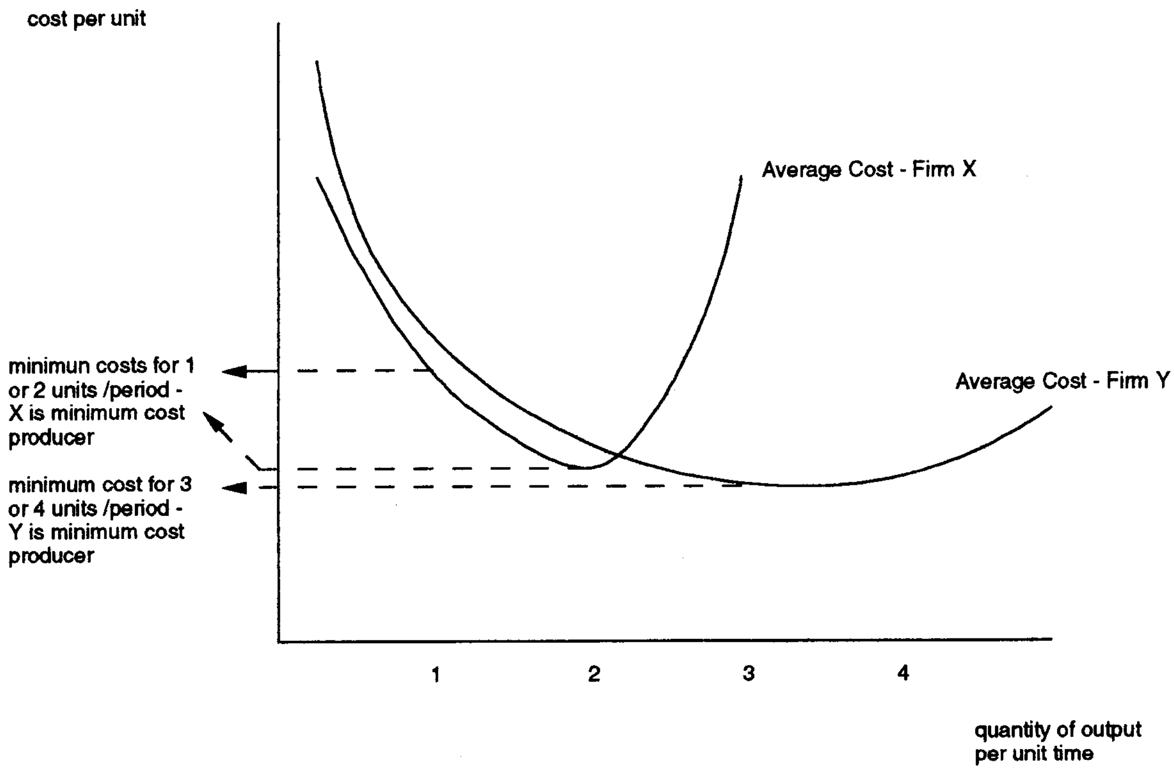
Splits serve to preserve surge capabilities by retaining facilities. Cost is limited by benchmarking producers against each other. By preserving both producers, the Navy also preserves the prospect of future price competition although, as noted earlier, there are other potential entrants in nonnuclear ship construction. NNS is, for example, a potential entrant in construction of DDG-51s. Such allocations, however, have significant negative effects as well. First, they impact firms' decisions regarding exit versus stay strategies. The possibility of receiving contracts on other than cost and quality considerations makes staying by weaker firms more attractive. Worse, the prospect of allocation based upon political or capability preservation considerations may not only provide the incentive for weak as well as stronger firms to stay, but may provide incentives for them to invest in capital improvements and attempt to retain employment levels. Doing so increases the likelihood of assignment by making the firm's failure at some future date all the more politically unpalatable. Thus, a vicious cycle may arise whereby the prospect of assignment first provides weaker firms with an incentive to stay when exit would otherwise be preferred and then provides incentives for market participants to retain as much capacity as possible, or even supplement capacity, rather than reduce it. In the process, the sector or industry as a whole, including those firms most viable during a prolonged reduction in Navy demand, get sicker and sicker.

Splitting of awards may not only delay decisions regarding exit but may also reduce incentives for shipyards to pursue commercial ventures and other alternative opportunities. No one would argue that the prospects for a renaissance in U.S. shipbuilding are overwhelming, but they do appear more promising now than they have in many years [23, 24]. It is also true that a healthy commercial construction sector would provide a desirable reserve for expanding military production if this was required at some future date.

The point is that the prospect of allocating new ship construction work for the purpose of preserving the industrial base may contribute to disorderly and inefficient downsizing. To the extent that the resources of more competitive firms as well as the less competitive are depleted in this process, allocation may degrade rather than preserve future U.S. shipbuilding capability.

The alternative to splitting the award is to compete production on the basis of price. In theory, this approach will prove most economical in the shortrun. How much production capacity it preserves, however, cannot be predicted. To see why, consider figure 1 which shows the hypothetical average cost curves of two ship producers, X and Y. In a bidding process designed to reveal these costs, the winner is contingent on the quantity. For quantities per unit time equal to one or two units, firm X would win because it is the most efficient or least-cost producer.

Figure 1. Minimum cost shipbuilders as a function of quantity procured



From an industrial base standpoint, however, a win by firm X might be less desirable than one by higher cost Y. To the extent that firm X is capacity constrained, it can only produce larger quantities of output per unit time at significantly higher cost. Of course, if the cost curve for firm X lies everywhere above that for Y, there isn't a problem because Y's victory satisfies an interest in current economy while still maintaining a substantial ramp-up capability.

Unfortunately, we can't be sure what various firms' cost curves are. Moreover, unless we can credibly commit not to bail out the winning firm if it does not deliver according to its offer, we cannot prevent buy-in's. If the firm with greater productive capacity wins, we will end up paying more for what we buy than we expected, but the production facility that is more efficient at high levels of output will remain. On the other hand, if the firm with less capacity wins on a buy-in, we would find ourselves paying more for what we buy in the short run and ending up with less production capability to boot. Finally, there is an issue of future economy. If competition results in X or Y's exit, then the price at which the government will be able to purchase units from the surviving firm in the future will depend in part on how costly it is for still other firms to enter this segment of the market.

As the preceding paragraphs suggest, no one policy regarding the downsizing of the shipbuilding industrial base is clearly preferable. In weighing the advantages, disadvantages, and risks associated with the possibilities, however, two facts are worth bearing in mind.

First, recall from table 5 that over the 25-year period charted, there have been entries into shipbuilding as well as exits. This is in sharp contrast to the situation in aerospace over the same period. This fact suggests that shipbuilding may be an easier industry to enter when conditions merit it (i.e., when demand for ships is high) than is the case for other weapons platforms. If so, then the risks of losing too much capability through competitive award of contracts rather than their allocation should receive less weight.

Second, consider the historical "maximum dry weight tonnage produced" values for each of the six currently active shipyards shown in parentheses in table 4. These amounts sum to 1,042,400 dry weight tons. The bottom line in table 5 shows the total dry weight tons of major naval vessels (carriers, submarines, combatants, assault ships, and large auxiliary ships) under production over five-year periods starting with 1960-64. In only one such period, 1965 to 1969, did the dry weight tonnage produced—1,296,700 dwt—ever exceed the maximum total capacity currently residing in the active Navy shipbuilding base. Moreover, maximum total current capacity is only slightly less than double the average dry weight tonnage under production since 1980 (roughly 590 dwt.) These are crude measures of industrial capacity, but the sheer magnitude of the differences suggests that there is substantial excess capacity in shipbuilding. Again, the implication is that the risk of losing too much capability through competitive award of contracts should not be overstated.

Defense capabilities and the vendor base

In addition to concern regarding the downsizing process occurring among prime contractors, there are also concerns about the downsizing of the subcontractor base. In a narrow sense, the concern is that failure of subcontractors as a consequence of a slowdown or hiatus in production will create bottlenecks in ongoing production and/or drive up future acquisition costs. In a broader sense, the concern is that intellectual and productive capabilities critical to national defense are being lost in the downsizing.

Concerns regarding shrinkage in the defense vendor base are not new. Gansler [7] suggests that a significant decline in the active defense subcontractor base occurred between 1960 and 1975. Similar claims have been made more recently [25, 26]. As noted in a recent GAO report, however, there appear to be no sources of data "identifying the specific number of jobs and the number of firms at the lower tiers of defense contracting [27].

In any case, even if hard data were available to demonstrate that the vendor base is shrinking and firms are exiting, this would not, in and of itself, justify intervention.

If defense budgets are to decline, production capability must fall—downsizing is precisely the process of shedding excess production capability. To justify intervention in this downsizing process, one must show that the market is systematically erring in its choices regarding which capabilities to retain and which to abandon.

Attempts to demonstrate that the market is systematically erring in regard to the defense capabilities it retains often cite studies conducted to identify "critical" component suppliers [28, 29]. In these studies suppliers qualify as critical according to whether:

- Their products are used now and are likely to be used in future systems

- They are the only suppliers of these products
- They are unlikely to survive a prolonged hiatus in production.

Criteria 1 and 2 reflect the military's dependence upon a given supplier, whereas 3 reflects the dependence of the supplier on defense-related business. In concert, these criteria provide a useful means of identifying vendors likely to produce production bottlenecks in systems under production. They are not, however, well suited for evaluating whether the defense subcontractor base as a whole is downsizing in an inappropriate fashion.

Criterion 1, for example, is sometimes argued to reflect the importance and, indirectly, the value of a given component supplier in future production. However, as noted in the introduction, the likelihood that certain components, and indeed certain systems, will be required or desired in the future is uncertain.

Likewise, criterion 2 is interpreted as providing a proxy measure of the uniqueness of a vendor's skills and capabilities. The quality of this proxy is, however, often questionable. Baldt Inc., for example, is frequently identified as a critical vendor because, until recently, it was the sole source supplier of anchor chain for the Navy. Its sole source status did not, however, result from unique production capabilities or knowledge, but instead from politically mandated domestic provision requirements. Other firms' sole source status arises not as a consequence of their particularly unique skills and capabilities in the manufacture of some type of component, but instead from holding proprietary rights to a specific component design.

Finally, criterion 3 is often interpreted as indicating the extent to which capabilities are liable to exit the defense base. However, measuring the loss of capabilities by potential, or even actual, loss of firms overstates the decline in capabilities throughout the base by tying their existence to the existence of specific organizations. Implicit in this connection is the generally false assumption that capabilities fundamentally reside in firms. According to this *bankruptcy as a fire* assumption, the exit process is one in which the failed firm's labor, capital, and designs are put in the building, the door locked, and the place burned down. Exit from an industry, be it a commercial or defense-related one, is generally not so dramatic nor are the consequences so dire.[6]

The demise of Studebaker Corporation in the mid-1960s provides a more typical example of a firm's exit from an industry. At the time, it produced a number of indistinct automobiles but also one, the designer Raymond Loewy's Avanti, which was acknowledged to be far ahead of its time. When the firm closed, two Studebaker dealers bought those Studebaker assets unique to the Avanti production line—design rights, plant, and tooling. Non-unique manufacturing capabilities such as those for producing engines were not purchased. Instead, Studebaker engines were replaced by engines from General Motors. Production of the car continued until 1985. At that point, the Avanti II company went into bankruptcy although, again, there was no fire—the company was purchased and production transferred from Akron to Youngstown, Ohio.

This example highlights the common mechanism for accomplishing exit from an industry—asset liquidation. Proprietary design rights, to the extent that they are perceived to have value, are sold at prices reflecting that value to the firm best able to capitalize on them, generally a firm involved in the production of related products. To the extent that production also involves specialized capital and/or labor skills (e.g., the case with the Avanti since it had a fiberglass body), the purchaser of the exiting firm's proprietary rights purchases the plant and/or hires the workers as well.

This same process is mirrored in defense. In a study of the vendor base conducted in the late 1970s, Baumbusch et al [31] documented subcontractor problems arising on a variety of weapons systems. For the seven systems studied, three experienced vendor bankruptcies (a gun mount manufacturer on the A-10 close support aircraft, a gyroscope motor and torque assembly manufacturer on the Maverick air-

6. This is not to say it doesn't occur. PEPCON exited the market in just this way in 1988. However, the event which precipitated its exit was not financial insolvency but incineration, PEPCON's product—ammonium perchlorate used in rocket propulsion—blew up, demolishing the plant [30].

to-ground missile, and a missile container manufacturer, also on the Maverick). An alternative source was found for the gun mounts, and the gyroscope and torque assembly production were brought in-house by the prime contractor, Hughes Aircraft, until suitable vendors could be found. Alternative contractors for the missile containers on the Maverick were also found, although for a different and, in the end more cost-effective design. Recent occurrences of vendor' failure have been similarly resolved.

At this point, one might concede that whereas market forces might appropriately retain capabilities in the case of ongoing projects where the value of and demand for certain components is clear, they won't necessarily retain those that might be required in the future. Trying to ascertain the value of a presently unused capability is undoubtedly more difficult than ascertaining the value of one that is currently in use. However, given such difficulties, it may be best to let firms with monetary incentives and expertise with the capability involved "speak with their bids" regarding its future prospects. Letting the market decide in this manner obviously presents a risk if no one enters to purchase a firm or assets thought to be critical. On the other hand, a dearth of bidders is a strong signal that there is consensus that those assets are not likely to be of use in the future.

The main point of this discussion is to emphasize that the existence of capabilities is not fundamentally tied to the name of the firm in which they reside nor can they only be maintained in that particular form. Failures on the part of firms in the vendor industrial base, due to mismanagement or simply to bad luck, have been and will continue to be met by bids from other firms. In this process, the capabilities of the defunct firm are maintained either intact (the firm is absorbed) or in dispersed form (valuable assets of the firm are absorbed).

References

[1] Stephen K. Conver, "Defense Industrial Base: Shaping the Downsizing," *Armed Forces Journal International*, Mar 1993

[2] Joel B. DuBow, "Defense Planning: Managing Market Contraction, *Defense Analysis*. Vol. 9, No. 3, 1993

[3] Bernard L. Schwartz, "What's Really Going on and What Lies Ahead in the Defense Industry—a U.S. Perspective," *International Defense Review*, 1993

[4] Jacques S. Gansler, "Transforming the U.S. Defense Industrial Base," *Survival*. Vol. 35, No. 4, Winter 1993

[5] Ralph Vartabedian, "Two Faces of Consolidation," *Los Angeles Times* (Wash. ed.), Mar 16, 1994

[6] F. M. Scherer, *The Weapons Acquisition Process: Economic Incentives*. Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1964

[7] Jacques S. Gansler, *The Defense Industry*. Massachusetts: The MIT Press, 1980

[8] Jacques S. Gansler, *Affording Defense*. Massachusetts: The MIT Press, 1989

[9] R.G. Lipsey and K. Lancaster, "The General Theory of the Second Best." *Review of Economic Studies*, XXIV, 1956-57

[10] Kathryn Rudie Harrigan, "Strategy Formulation in Declining Industries", *Academy of Management Review*. Vol. 5, No. 4, 1980

[11] Kathryn Rudie Harrigan, "Exit Decisions in Mature Industries," *Academy of Management Journal*, Vol. 25, No. 4, 1982

[12] Kathryn Rudie Harrigan and Michael E. Porter, "End-Game Strategies for Declining Industries, *Strategic Planning Comes of Age.* Boston: Harvard Business Review Press, 1986

[13] Michael C. Jensen, "The Modern Industrial Revolution, Exit, and the Failure of Internal Control Systems," *The Journal of Finance,* Vol. XLVIII, No. 3, Jul 1993

[14] Thomas L. McNaugher, *New Weapons, Old Politics, America's Military Procurement Muddle.* Washington, D.C., The Brookings Institution, 1989

[15] David M. Kreps, *A Course in Microeconomic Theory.* New Jersey: Princeton University Press, 1990

[16] Frank R. Lichtenberg, "The Private R&D Investment Response to Federal Design and Technical Competitions," *The American Economic Review,* Jun 1988

[17] Jacob Goodwin, *Brotherhood of Arms, General Dynamics and the Business of Defending America.* New York: Times Books, 1985

[18] Alain C. Enthoven and K. Wayne Smith, *How Much Is Enough? Shaping the Defense Program, 1961-1969.* New York: Harper and Row, 1971

[19] Richard A. Stubbing with Richard A. Mendel, *The Defense Game.* New York: Harper and Row, 1986

[20] John W. Newcomb and Anthony R. DiTrapani, "The Patrol Frigate Program—A New Approach to Ship Design and Acquisition," *Naval Engineers Journal,* Aug 1973

[21] Patrick Tyler, *Running Critical—The Silent War, Rickover, and General Dynamics.* New York: Harper & Row, 1986

[22] "DDG-51 Split 'Buys Time' for New Acquisition Strategy," *Defense Daily,* Vol. 183, No. 49, Jun 10, 1994

[23] Marine Update, "Title XI Catapults U.S. Yards into the Export Market," *Marine Log,* Sep 1994

[24] Richard F. Burns, "Will U.S. Shipbuilders Make the Transition?" *Sea Technology*, Feb 1994

[25] The American Defense Preparedness Association (ADPA) White Paper, "Shrinking Markets Put Subcontractors on Edge," *National Defense*, May/Jun 1993

[26] Ann Markusen and Joel Yudken, *Dismantling the Cold War Economy*. Basic Books, 1992

[27] U.S. General Accounting Office, *Defense Procurement—Trends for 1985-93 in DOD's Spending, Employment and Contractors* (GAO/NSIAD-92-274BR), Aug 1992

[28] RAND, *The U.S. Submarine Production Base—An Analysis of Cost, Schedule, and Risk for Selected Force Structures*, by John Birkler, John Schank, Giles Smith, Fred Timson, et al, 1994

[29] NAVSEA Shipbuilding Support Office, AEGIS, Industry Base Assessment, by David Hollister, Draft

[30] The Institute for National Strategic Studies, National Defense University, *Managing Crises in Defense Industry: The Pepcon and Avtex Cases*, by Steven R. Linke, Jul 1990

[31] RAND, *Peacetime Adequacy of the Lower Tiers of the Defense Industrial Base*, by Geneese G. Baumbusch and Alvin J. Harman, Nov 1977

List of tables

Distribution list

SNDL

A1B	UNSECNAV
A1J	ASSTSECNAV RDA WASHINGTON DC
A1J	DASN - SHIP PROGRAMS
ASN	DASN/RAP
FKA1G	COMNAVSEASYSCOM WASHINGTON DC
	Attn: NAVSEA-00
	Attn: SEA-07
	Attn: SEA-90

OPNAV

N4
N43
N4B
N80
N81
N86
N87

CNA

Document Separator

United States General Accounting Office

GAO

Report to Congressional Requesters

October 1994

ATTACK SUBMARINES

Alternatives for a More Affordable SSN Force Structure

GAO/NSIAD-95-16

GAO

United States
General Accounting Office
Washington, D.C. 20548

National Security and
International Affairs Division

B-248259

October 13, 1994

The Honorable Edward M. Kennedy
Chairman, Subcommittee on Regional
Defense and Contingency Forces
Committee on Armed Services
United States Senate

The Honorable John Conyers, Jr.
Chairman, Legislation and National
Security Subcommittee
Committee on Government Operations
House of Representatives

In response to your requests, we evaluated (1) the Navy's strategy for maintaining the nuclear-powered attack submarine (SSN) force structure as directed in the Department of Defense's bottom-up review and (2) alternatives available to the Navy for maintaining its SSN force structure at less cost.

As agreed with your offices, we plan no further distribution of this report until 30 days from its issue date. At that time, we will send copies to the Chairmen, Senate Committee on Governmental Affairs, House Committee on Government Operations, Senate and House Committees on Appropriations, and Senate and House Committees on Armed Services; the Director, Office of Management and Budget; and the Secretaries of Defense and the Navy. Copies will be made available to others on request.

If you or your staff have any questions on this report, please call me on (202) 512-3504. Major contributors to this report are listed in appendix V.

Richard Davis

Richard Davis
Director, National Security
Analysis

Executive Summary

Purpose

Nuclear-powered attack submarines (SSNs) are the Navy's prime antisubmarine warfare asset. Today, faced with a changed world threat, a new defense posture, and constrained defense budgets, the Navy is reducing the size of its SSN fleet.

In response to requests from the Chairmen, Subcommittee on Regional Defense and Contingency Forces, Senate Committee on Armed Services, and the Legislation and National Security Subcommittee, House Committee on Government Operations, GAO reviewed (1) the Navy's strategy for maintaining the SSN force structure as directed in the Department of Defense's (DOD) bottom-up review and (2) alternatives available to the Navy for maintaining its SSN force structure at less cost.

Background

For more than four decades, U.S. national security and military strategies focused on fighting a global war with the former Soviet Union. However, after the dissolution of the Warsaw Pact and the Soviet Union, the Navy began to refocus its maritime strategy. Because of the changed threat and constrained U.S. defense budgets, the Navy plans to reduce its fleet of 87 SSNs to 55 by fiscal year 1999. The DOD's bottom-up review determined that the Navy needed to maintain a force of 45 to 55 SSNs thereafter to meet the requirements of the defense strategy, including both regional conflicts and peacetime presence operations. GAO did not independently verify or validate DOD's force level requirements.

Results in Brief

To maintain an SSN force of 45 to 55 submarines, as directed in DOD's bottom-up review, and remain within affordable budgets, the Navy plans to (1) extend the amount of time SSNs operate between major maintenance periods, (2) allow no more than three costly SSN-688 submarine refuelings per year, and (3) operate the submarines for their design service life of 30 years. At the same time, the Navy plans to acquire 31 SSNs through 2014 at an estimated procurement cost of $48 billion.[1] This approach allows the Navy to maintain an SSN force close to the required maximum of 55 SSNs through 2020.

GAO identified several alternatives that would allow the Navy to free up money and still maintain the required minimum force structure of 45 SSNs. For example, GAO analysis shows that if the Navy were to acquire only 25 SSNs through 2014, it could save $9 billion in procurement costs and

[1]Unless stated otherwise, all cost estimates in this report are expressed in undiscounted constant fiscal year 1998 dollars. Discounted cost estimates are presented in appendix III.

maintain an SSN force close to 55 through 2013, but declining to 45 SSNs by 2020—still within the range directed by the bottom-up review. Under another alternative, the Navy could consider studying the feasibility of operating some SSN-688s beyond 30 years and defer spending an additional $8 billion in procurement costs. A third alternative would be to defer new construction of SSNs and free up billions of dollars in the near term. While GAO and DOD do not know the magnitude of the reconstitution costs, this alternative offers the opportunity to defer near-term costs at a time when defense budgets have been reduced. Further, studies have shown that the estimated reconstitution costs to restart submarine construction in 2003 are less than the potential $9 billion savings, suggesting that a deferral strategy is worth further study.

Principal Findings

Navy Is Increasing Submarine Operating Cycles to Achieve an Affordable SSN Force Structure

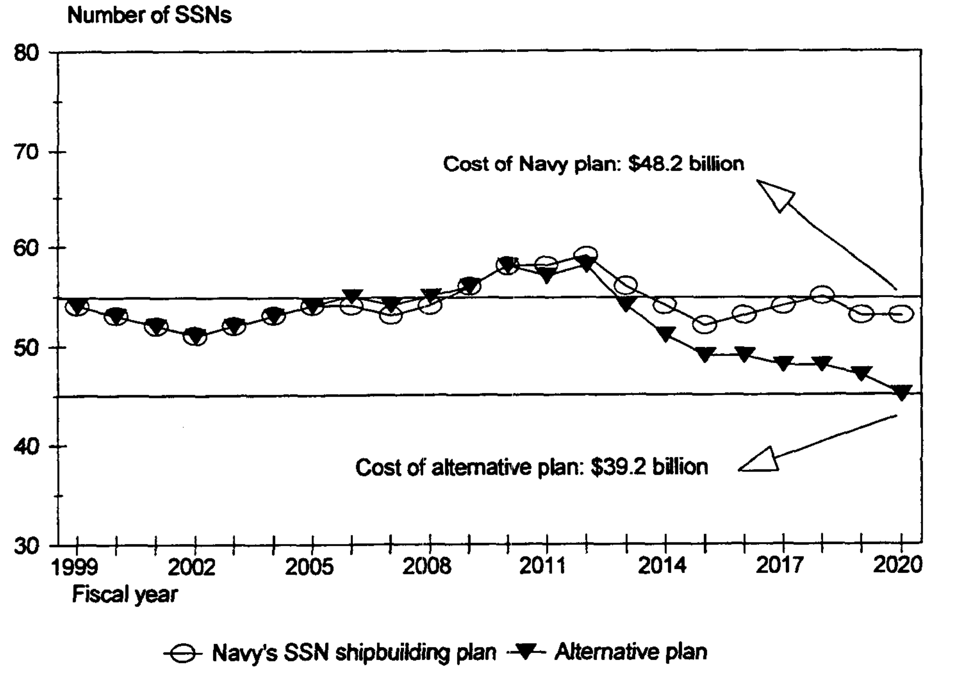
Until recently, the Navy planned to operate the SSN-688s for three 84-month cycles, perform major maintenance twice, and retire the submarines after 24 years. If the Navy had continued to follow this approach it would have faced the unaffordable procurement cost of $68 billion to build 44 SSNs to maintain a minimum 45-SSN force through 2020. Funding at that level would have consumed about 45 percent of the Navy's shipbuilding budget, double the historical average. Also, the Navy would have had to perform costly refueling overhauls (at about $294 million each) on as many as six SSN-688s in 1 year, which the Navy believed was unaffordable.

In July 1992, the Navy began to evaluate the feasibility of extending the operating cycle of SSN-688s beyond 90 months. The study is expected to be completed in November 1994. Based on preliminary analysis, the Navy has begun using an extended 120-month operating cycle for planning and scheduling purposes. The Navy also plans to operate its SSN-688 fleet for 30 years.

Navy Can Maintain Force Structure by Buying Fewer SSNs

The Navy currently plans to begin to build 31 SSNs (1 Seawolf class and a new 30-ship class of SSNs) from 1996 through 2014 at an estimated procurement cost of $48 billion to support an SSN force level close to the maximum required force structure through 2020. GAO analysis shows that the Navy could buy six fewer submarines at a procurement cost savings of $9 billion while sustaining SSN production. Using this alternative, the Navy would maintain an SSN force level close to its currently planned level through 2013, declining to the minimum required force structure by 2020. The difference between the Navy's plan and this alternative plan is illustrated in figure 1.

Figure 1: Comparison of the Navy's Shipbuilding Plan and Alternative Plan



Service Life Extension of Nine Refueled SSN-688s Could Further Reduce SSN Procurements

The Navy has an opportunity to study the feasibility of extending the SSN-688's service life beyond 30 years. Because the older SSN-688s are being refueled, they will have sufficient nuclear fuel to operate for an additional 120-month operating cycle beyond the end of their 30-year design life. The Navy has previously extended the SSN-637 class submarines' service life from 20 to 30 years and is studying an extension from 30 to 40 years for the SSBN-726 (Trident) class submarines. Although not planned at this time, Navy officials stated that a similar study at the end of this decade could be the basis for extending SSN-688s' service life. If the Navy were to perform a third overhaul on the nine newest refueled SSN-688s and operated them for one more 120-month operating cycle, the submarines could operate for

42 years. This would reduce to 17 the number of SSNs the Navy needs to buy through 2014, at a procurement cost savings of $21 billion, while maintaining an SSN force level within the range directed by the bottom-up review. GAO estimates the cost of performing the third overhauls on nine submarines to be about $4 billion, resulting in a net savings of about $17 billion.

Navy Could Consider Deferring Construction

To sustain the submarine shipbuilding industrial base, DOD is expected to request construction funding for new SSNs in 1996 and 1998. However, the Secretary of Defense has told Congress that there is no force structure need to build SSNs until after the turn of the century. GAO analysis shows that construction could be deferred into the next decade, freeing up billions in planned shipbuilding funds. For example, deferring construction until 2003 instead of following the Navy's plan could free up as much as $9 billion in procurement funding. However, this acquisition strategy would require higher average annual production rates and higher annual shipbuilding budgets when SSN production resumed. While GAO and DOD do not know the magnitude of the reconstitution costs, this alternative offers the opportunity to defer near-term costs at a time when defense budgets have been reduced. Further, studies have shown that the estimated reconstitution costs to restart submarine construction in 2003 are less than the potential $9 billion savings, suggesting that a deferral strategy is worth further study.

Matter for Congressional Consideration

GAO believes that Congress should consider these analyses of less costly alternatives as it deliberates SSN force structure and acquisition issues.

Agency Comments

DOD provided comments on a draft of this report, which are included in appendix IV. Although DOD agrees with certain aspects of each of the alternatives presented by GAO in the report, none is supported by DOD.

DOD did not take issue with the smaller SSN forces that would result from accepting any of the alternatives presented in the report, and DOD agreed that procuring a smaller submarine force would cost less. However, DOD disagreed with the magnitude of cost savings or cost avoidance cited by GAO in each of the alternatives because DOD believes that the savings would be reduced by shutdown and reconstitution costs or increased unit costs by building fewer submarines. However, neither GAO nor DOD knows the magnitude of the reconstitution costs, and DOD officials estimate the increased unit costs to be less than $1 billion.

OSD and the Navy believe that deferral is not a preferable strategy because of (1) adverse impacts to the submarine industrial base, (2) higher annual production rates requiring high percentages of shipbuilding budgets, and (3) a resulting lesser quality SSN force. While OSD and the Navy do not agree on how many submarine industrial base vendors are critical, they both believe that all submarine-unique component vendors will lose their capabilities under the deferral strategy presented. Higher out-year production rates and costs are an outcome of a deferral strategy in which the benefits are more near term. However, even the Navy's shipbuilding plan includes a series of high production rates in the out-years. Qualitatively, the SSN force structure provided under the deferral strategy is close to meeting the Joint Chiefs' requirements.

Contents

Tables

Figures

Abbreviations

DOD	Department of Defense
OSD	Office of the Secretary of Defense
SSBN	Nuclear-Powered Ballistic Missile Submarine
SSN	Nuclear-Powered Attack Submarine

Introduction

For more than four decades, U.S. national security and military strategies focused on fighting a global war with the former Soviet Union. During this period, an increasingly quiet and more capable Soviet submarine force drove the U.S. Navy's nuclear-powered attack submarine (SSN) force level requirement and the need for newer, quieter, and more capable SSNs. However, with the collapse of the Warsaw Pact and the December 1991 breakup of the Soviet Union, the Navy began to refocus its maritime strategy. The new strategy places greater emphasis on regional contingencies, which are considered the most likely scenarios to involve U.S. naval forces, and requires a smaller fleet. The Navy, which had already begun to reduce the size of the fleet in the late 1980s, is planning further reductions to respond to direction in the Department of Defense's (DOD) bottom-up review[1] and constrained U.S. defense budgets.

Navy Has Been Reducing SSN Force in Response to Changing Threat

In 1988, the Navy's requirement for SSNs dictated by the Navy's maritime strategy was 100 submarines. Under the 1991 base force concept, the Navy reduced the fiscal year 1995 SSN force level requirement to 80. Prior to 1993, the Navy took several measures to reduce the SSN force structure, including (1) accelerating the retirement of the SSN-637 class so that the entire class (except for two special purpose ships) would be retired by the end of the century, (2) removing five improved Los Angeles class (SSN-688I) submarines from its shipbuilding plan, and (3) truncating the Seawolf class shipbuilding program after construction of the second submarine (SSN-22). In 1992, the Deputy Secretary of Defense directed the Joint Chiefs of Staff to conduct a comprehensive examination of the submarine forces needed to meet the future threats to American interests. In April 1993, the Joint Chiefs concluded that 51 to 67 SSNs were needed to satisfy the National Military Strategy's requirements. Additionally, the Joint Chiefs required that a portion of the submarine force in 2012 have Seawolf class stealth and more capability than either the SSN-688 or SSN-688I class submarines to meet the emerging threat posed by new generation nuclear and diesel-electric submarines.

The Navy's current SSN force consists of 87 SSNs, including 54 Los Angeles class submarines (SSN-688). Two classes of SSNs are still being built—seven SSN-688Is and two Seawolf class (SSN-21). (See app. II for a description of the SSN classes and a comparison of their characteristics.)

[1]Report on the Bottom-Up Review, Department of Defense (Washington, D.C., Oct. 1993).

Bottom-Up Review Directs Further SSN Force Reductions

Following the April 1993 Joint Chiefs report, the Secretary of Defense in his October 1993 bottom-up review recognized that

"the threat that drove our defense decision-making for four and a half decades—that determined our strategy and tactics, our doctrine, the size and shape of our forces, the design of our weapons and the size of our defense budgets—is gone."

Specifically, the review determined that

- a force of 45 to 55 SSNs is needed to meet the requirements of the defense strategy, including both regional conflicts and peacetime presence operations;
- production of the third Seawolf class submarine (SSN-23) beginning in fiscal year 1995 or 1996[2] at Electric Boat[3] would bridge the projected gap in submarine construction; and
- the Navy should develop and build a new attack submarine as a more cost-effective follow-on to the Seawolf class, with construction beginning in fiscal year 1998 or 1999 at Electric Boat.

The last two decisions were made to maintain the two shipyards that currently build all of the Navy's nuclear-powered ships: Electric Boat and Tenneco Corporation's Newport News Shipbuilding and Dry Dock Company (Newport News Shipbuilding), Newport News, Virginia. Newport News Shipbuilding also builds nuclear-powered aircraft carriers. These decisions were accepted in the Secretary of Defense's Defense Planning Guidance for fiscal years 1995 through 1999.

The number of SSNs in the active fleet will primarily be dependent upon the (1) number of submarines being retired each year, (2) building rate, and (3) security environment. As a result, DOD expects the number to vary from year to year but be within the established range of 45 to 55 SSNs.

Navy Actions to Reduce SSN Force to 55

To reduce its SSN force to the maximum of 55 submarines by 1999, the Navy plans to retire 31 pre-SSN-688 class submarines and 10 of its older SSN-688s, while taking delivery of the 7 SSN-688Is and 2 Seawolf class submarines currently under construction. Retirement of the 10 SSN-688s will take place at about the midpoint of their 30-year design life, or the time a refueling overhaul would be required; therefore, each of these submarines will have as much as 14 years of their design service life

[2]DOD plans to request SSN-23 funds in fiscal year 1996.

[3]General Dynamics Corporation's Electric Boat Division (Electric Boat), Groton, Connecticut.

remaining. The Navy believes that retiring the SSN-688s prior to their mid-life refueling is the lowest cost means of reducing the SSN force. The Navy says it will save the cost of the refueling overhaul of the 10 SSN-688s, approximately $294 million each. After fiscal year 1999, the Navy plans to retire an additional three SSN-688s at their mid-life. These actions do not have an adverse impact on the SSN force structure in the long term because the submarines being retired early are some of the oldest of the SSN-688 class.

Objectives, Scope, and Methodology

In response to requests from the Chairmen, Subcommittee on Regional Defense and Contingency Forces, Senate Committee on Armed Services, and the Legislation and National Security Subcommittee, House Committee on Government Operations, we reviewed (1) the Navy's strategy for maintaining the SSN force structure as directed in the DOD's bottom-up review and (2) alternatives available to the Navy for maintaining its SSN force structure at less cost.

To accomplish our objectives, we obtained and analyzed information on the Navy's current SSN force levels, construction programs, and estimated future SSN force levels and budgets. We did not independently verify or validate DOD's force level requirements determined by the bottom-up review.

To determine the effects of different alternatives on the SSN force structure and on the nuclear-powered shipbuilding industrial base and the feasibility of extending the operating cycle and the operational life of SSN-688s, we met with key Navy program and technical officials. We began by analyzing the Navy's submarine shipbuilding plans of September 1993 (presented in table 3.1) and then analyzed the effects of different assumptions concerning shipbuilding profiles. In developing force structure models for comparing alternative acquisition strategies, we first modeled the existing force structure using the Navy's assumptions for (1) the starting force level (54 SSN-688s and SSN-21s in fiscal year 1999), (2) the retirement of 13 SSN-688s at their mid-life and the remaining SSN-688s at 30 years, (3) the submarine construction period for new submarines (6 years for a lead ship and 5 years for subsequent ships), and (4) the cost estimate for the SSN-23.

For new attack submarine costs, we used estimates from the September 1993 cost and operational effectiveness analysis of the baseline new attack submarine—$2.8 billion (in constant fiscal year 1994 dollars with no production savings)[4] and \$1.5 billion for 29 follow-on submarines.[5] On August 1, 1994, DOD approved Phase I design efforts for the new attack submarine program but has not released a specific acquisition plan with cost estimates. We did not verify or validate the estimates of reconstitution costs presented in chapter 4.

To aid comparison of alternatives, we also performed a present value analysis of each force structure alternative's funding profile to account for the time value of money, since each investment alternative has a different annual funding profile. This analysis showed no relative difference from the constant dollar analysis of funding used throughout the report. Appendix III contains a more detailed discussion of our present value analysis.

We observed a regional crisis demonstration and toured the USS Key West (SSN-722), the USS Finback (SSN-670), and the submarine tender USS L.Y. Spear (AS-36), which are stationed at Norfolk, Virginia. We also toured four of the Navy's six nuclear-capable public repair and maintenance shipyards. (See app. I for a listing of the organizations visited during our review.)

Our review was performed between October 1992 and June 1994 in accordance with generally accepted government auditing standards.

[4]The estimate would be \$3.1 billion in fiscal year 1998 dollars, which we used in our calculations.

[5]A fiscal year 1998 dollar estimate provided by new attack submarine program officials.

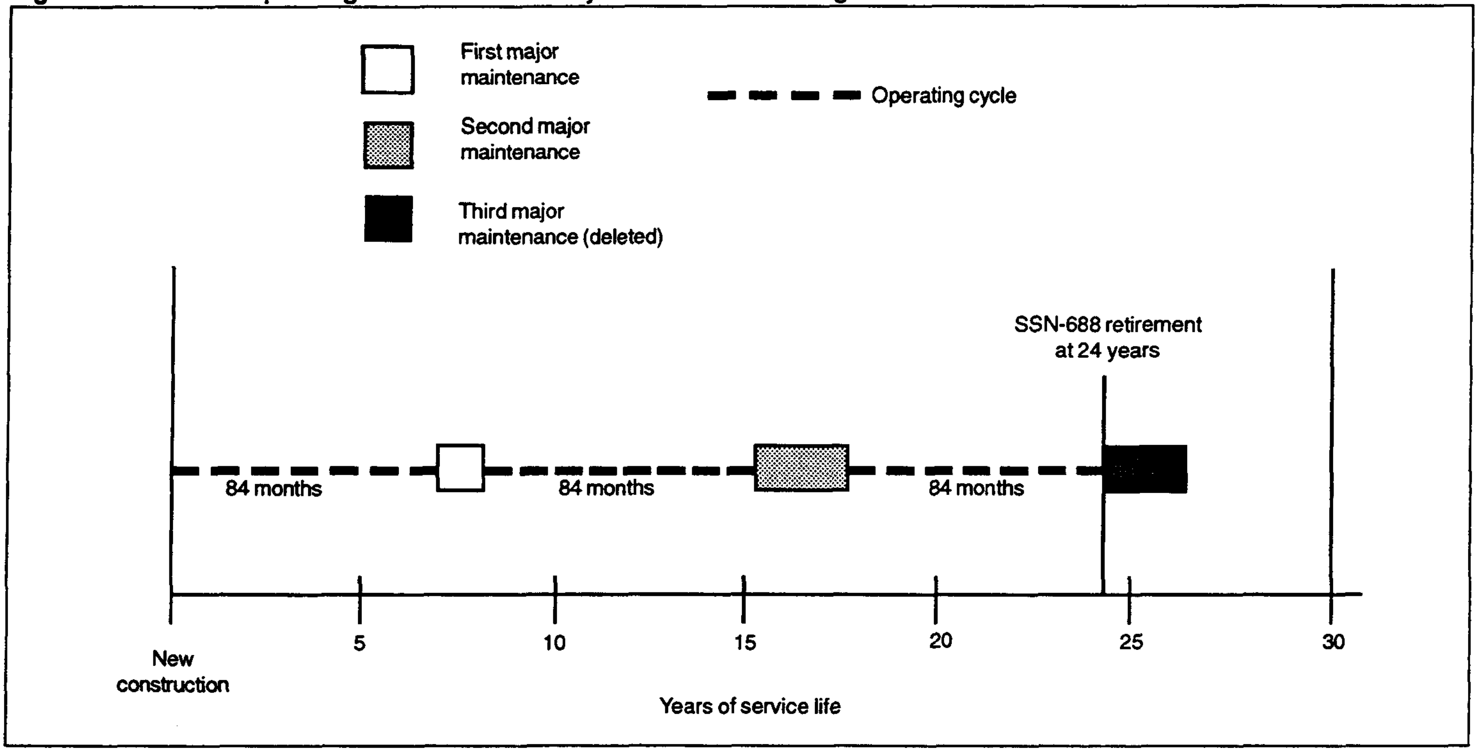
Navy Is Increasing SSN Operating Cycles to Achieve an Affordable Force Structure

The Navy's SSN-688 class submarines are designed to operate for 30 years. However, until recently, Navy submarine operating and maintenance plans would have resulted in the early retirement of most of the fleet. The Navy recognized that building submarines to replace the retired fleet would require more funds than it could afford. It therefore initiated a study to determine the feasibility of increasing the SSN-688's operating cycles. An increase in operating cycle would enable the fleet to operate for 30 years and thereby support a more affordable acquisition strategy to meet the force level requirement set by the bottom-up review. Although the study is not expected to be completed until November 1994, the Navy has recently determined that an increase in the SSN-688's operating cycle sufficient to operate for 30 years is technically feasible.

SSN-688 Maintenance Plans Required Changes

Navy regulations require that SSNs undergo major maintenance, which is fundamental to safe submarine operation, at fixed intervals. The interval between major maintenance is called an operating cycle. When SSN-688 class submarines entered the fleet in 1976, the operating cycle was 70 months with three major maintenance periods. In 1981, the operating cycle was extended to 84 months with three major maintenance periods. In 1987, the Navy eliminated the third major maintenance period and planned to retire the SSN-688s after about 24 years of service. Figure 2.1 shows the SSN-688s' operating and maintenance cycles after elimination of the third maintenance period.

Figure 2.1: SSN-688 Operating and Maintenance Cycles After 1987 Changes



Source: Our analysis of Navy data.

Because the SSN-688s would operate for only about 4 years after the third overhaul, which takes about 2 years, the Navy believed that such a short operating cycle was not worth the expense of a third overhaul.

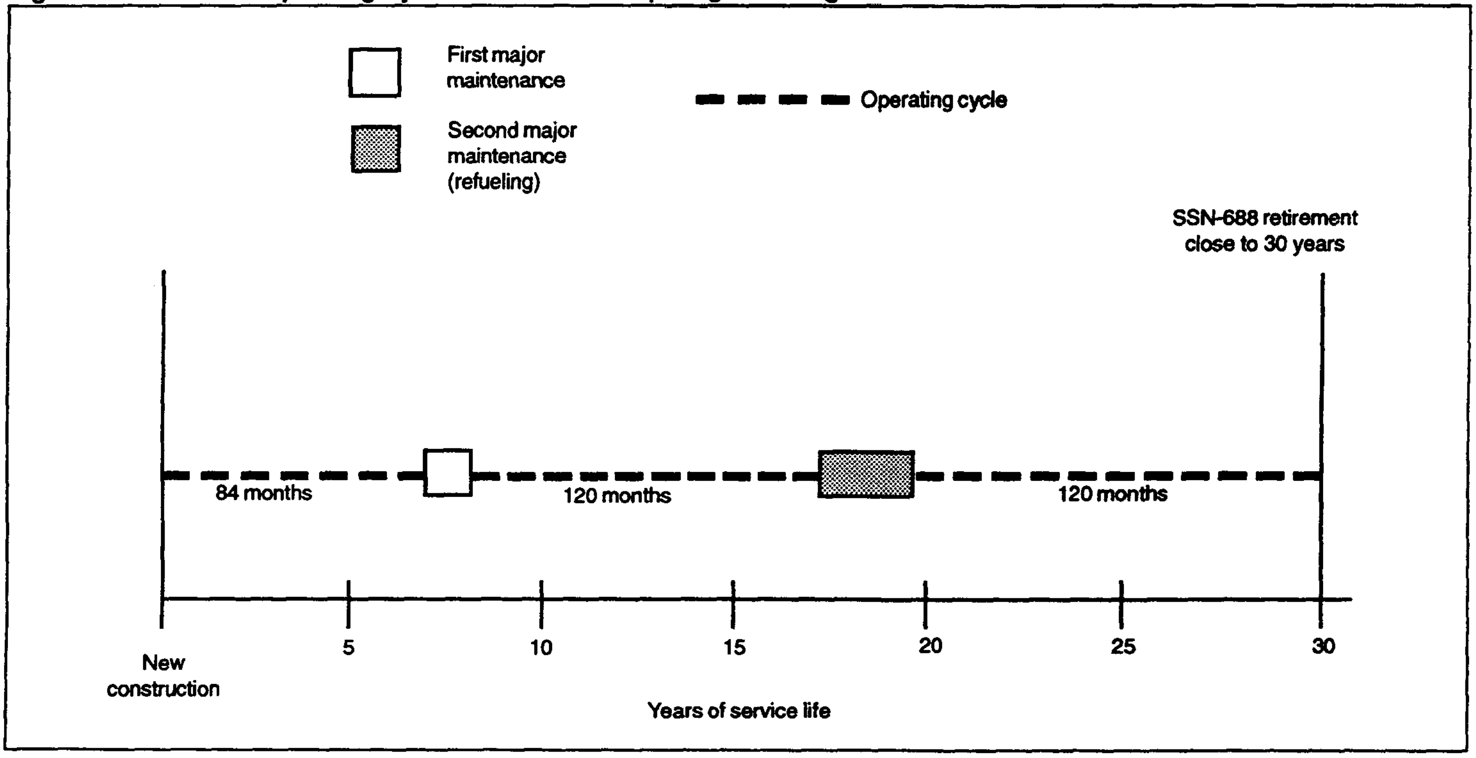
Retiring the SSN-688 fleet at 24 years was unaffordable. Our analysis shows that the Navy would have to build 44 SSNs at an estimated procurement cost of $68 billion to maintain a minimum force of 45 submarines through 2020. We estimate that the Navy would have to commit about 45 percent of its shipbuilding and conversion budget to support this level of SSN procurement, more than double the historical 20 percent spent for SSN construction.

Another factor influencing the Navy's need to alter its operating cycles was an unaffordable SSN maintenance burden. In February 1992 guidance for developing budgets for fiscal years 1994 and beyond, Navy officials directed that no more than three submarine refuelings could be funded per year. Of the 62 SSN-688 class submarines built or under construction, the older 31 were all scheduled to receive refueling overhauls at the time of their second major maintenance period. The newer 31 SSN-688s in the class are not expected to require a refueling overhaul. Because SSN-688 class submarines were built in large numbers from year to year, the number of submarine refueling overhauls could reach as high as six in a single year. At about $294 million per refueling, the costs could rise as high as $1.8 billion per year.

Navy Is Studying Extension of Operating Cycle

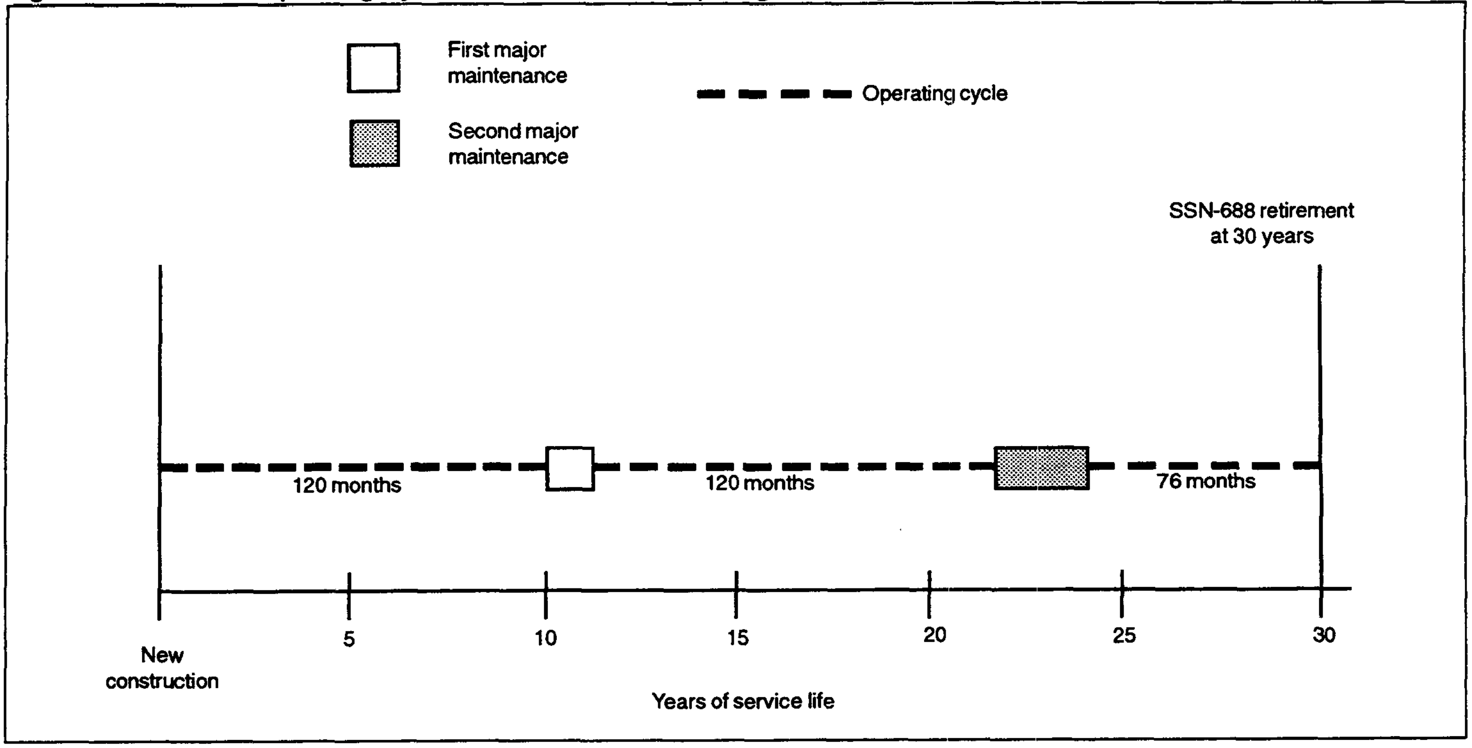
In July 1992, the Navy began to evaluate the feasibility of extending the SSN-688 class operating cycle beyond 90 months so that it could spread refueling overhauls over a longer period of time. Much of the data for the operating cycle extension study will come from engineering evaluations of system and component condition from the first three SSN-688s in refueling overhaul and SSN-688s undergoing other maintenance. To date, the refueling overhaul of two SSN-688s is near completion, and the refueling of the third has just begun. The condition of 111 of 119 major systems on SSN-688 class submarines has been reviewed. According to Navy officials, based on preliminary analysis of the data received from the two refueling overhauls and other inspections, a 120-month operating cycle is technically feasible. The Navy expects that the extension study will be complete in November 1994. Figures 2.2 and 2.3 show that a 120-month operating cycle allows SSN-688 class submarines to operate for 30 years with only two major maintenance periods. Figure 2.2 applies to the 18 remaining SSN-688s requiring refuelings.

Figure 2.2: 120-Month Operating Cycle for SSN-688s Requiring Refueling



Source: Our analysis of Navy data.

Figure 2.3: 120-Month Operating Cycle for SSN-688s Not Requiring Refueling



Source: Our analysis of Navy data.

Although the SSN-688 operating cycle study is not yet complete, the Navy has begun using a 120-month operating cycle for fleet planning and budget purposes. For example, according to Navy officials, the fiscal year 1995-99 program review assumed a 120-month operating cycle for the SSN-688s to allow the reduction of planned refueling overhauls to no more than three per year. In November 1993, the Navy used a 120-month operating cycle as the basis for the scheduling of refueling overhauls and maintenance at its shipyards through fiscal year 2003.

While the Navy has begun to implement a 120-month operating cycle for SSN-688 class submarines, Navy officials stated that significant problems with some SSN-688 components may prevent them from extending the operating cycle to 120 months without three 2- or 3-month maintenance periods to repair or replace the components. Examples of such components are hull castings and seawater valves, which require a drydocking and welding for repair.

Alternatives to the Navy's Shipbuilding Plan Are Less Costly and Meet DOD's Needs

Although the Navy can maintain a force level of 45 to 55 SSNs through 2020 with its current shipbuilding plan, our analysis shows that the Navy can meet its requirement by building fewer submarines. This alternative would allow the Navy to sustain SSN production and buy six fewer submarines, saving $9 billion in procurement costs. The Navy could also consider extending the service life of 9 refueled SSN-688s and buy 14 fewer submarines than currently planned, saving an additional $8 billion in procurement costs.

Navy SSN Shipbuilding Plan Will Support DOD's Requirement

The shipbuilding plan[1] shows that the Navy expects to begin building 31 SSNs between 1996 and 2014. In response to direction in the bottom-up review, the Navy plans to begin building the SSN-23 at Electric Boat in 1996. The Navy estimates the SSN-23 will require $1.5 billion[2] more in fiscal year 1996 than the $900 million already appropriated. A new class of attack submarines is planned to be initially built at Electric Boat beginning in 1998; the Navy plans to begin construction of 30 by 2014. The design and construction cost of the first new attack submarine is estimated at $3.1 billion. Follow-on SSNs are expected to cost about $1.5 billion each. Table 3.1 shows the Navy's SSN shipbuilding plan along with estimated construction costs.

[1]This shipbuilding plan was the Navy's notional plan dated September 30, 1993. The plan matched the shipbuilding profile underlying the Navy's Program Review 95, which was approved by the Secretary of the Navy in September 1993.

[2]The estimate would be $1.6 billion in fiscal year 1998 dollars, which we used in our calculations.

Table 3.1: Navy's SSN Shipbuilding Plan and Estimated Costs

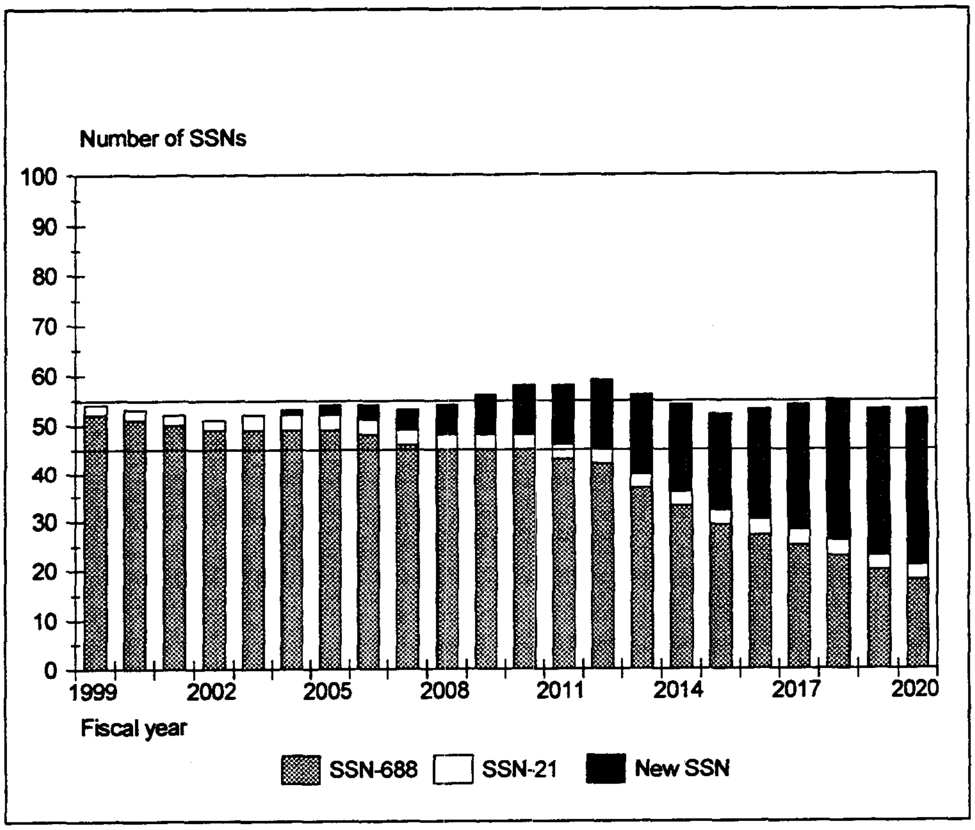
Fiscal year 1998 dollars in billions

Fiscal year	Quantity	Cost
1996	1	$1.6
1997	0	0
1998	1	3.1
1999	0	0
2000	1	1.5
2001	1	1.5
2002	1	1.5
2003	2	3.0
2004	2	3.0
2005	2	3.0
2006	2	3.0
2007	2	3.0
2008	2	3.0
2009	2	3.0
2010	2	3.0
2011	3	4.5
2012	3	4.5
2013	3	4.5
2014	1	1.5
Total	**31**	**$48.2**

Source: Our analysis of Navy data.

As shown in figure 3.1, the Navy's shipbuilding plan will support an SSN force level close to the required maximum of 55 SSNs through 2020. The Navy plans to begin construction of 3 SSNs every 2 years beginning in 2015 in order to maintain a 45-SSN force over the long term.

Figure 3.1: Effects of the Navy's SSN Shipbuilding Plan on SSN Force Levels (1999-2020)



Source: Our analysis of Navy data.

Navy Can Maintain Minimum Force Structure by Buying Fewer SSNs

The Navy's shipbuilding plan maintains an SSN force level near the maximum 55 SSNs required in DOD's bottom-up review through 2020. Our analysis shows that the Navy would need to fund only 25 SSNs through 2014 and save about $9 billion in procurement costs. Using this alternative, the Navy would maintain an SSN force level close to the maximum 55 SSNs required in DOD's bottom-up review through 2013 before declining to 45 SSNs in 2020, continue low-rate SSN construction, and never require funds for more than 2 SSNs per year. Beyond 2014, this alternative would require managed procurements of no more than three SSNs per year. Table 3.2 shows this alternative plan and the estimated costs.

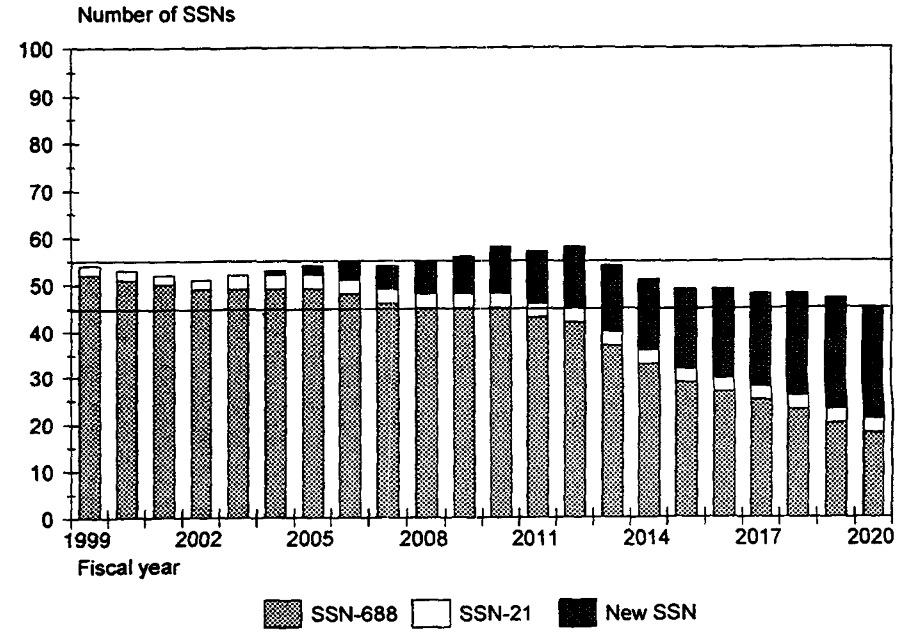
Table 3.2: Alternative SSN Shipbuilding Plan and Estimated Costs

Fiscal year 1998 dollars in billions

Fiscal year	Quantity	Cost
1996	1	$1.6
1997	0	0
1998	1	3.1
1999	0	0
2000	1	1.5
2001	2	3.0
2002	1	1.5
2003	2	3.0
2004	1	1.5
2005	2	3.0
2006	1	1.5
2007	2	3.0
2008	1	1.5
2009	1	1.5
2010	2	3.0
2011	2	3.0
2012	1	1.5
2013	2	3.0
2014	2	3.0
Total	**25**	**$39.2**

Figure 3.2 shows SSN force level projections based on this alternative SSN shipbuilding plan.

Figure 3.2: SSN Force Level Projections Through 2020 if the Navy Buys 25 SSNs Through 2014
(1999-2020)



Refueling Older SSN-688s Offers Opportunity to Reduce Procurements

The Navy could extend the SSN-688's service life beyond 30 years. The first half of the SSN-688 fleet is scheduled to be refueled at about the midpoint of the submarine's design life. The new nuclear cores to be installed are of the same design as those installed in the second half of the SSN-688 class. With these new nuclear cores, the early SSN-688 class submarines will have sufficient fuel to operate for an additional 120-month operating cycle at the end of their 30-year design life. Furthermore, officials from both SSN shipbuilders stated that SSN-688 class submarines could operate for much longer than 30 years; one of the shipbuilders stated that 10 to 20 years of additional service would not be unreasonable.

Past Navy actions indicate that extending a submarine's service life may be feasible. After a 5-year study was completed on the SSN-637 class submarine—the predecessor of the SSN-688 class—the design life was extended from 20 years to 30 years, with a possible extension to 33 years on a case-by-case basis.[3] According to Navy officials, a similar study could be the basis for extending the SSN-688's service life. Technical information

[3]Budget decisions in 1989 led the Navy to accelerate the retirement of the SSN-637 class so that most will be retired by 27 years of service.

(1) produce no new submarines between FY 1996 and FY 2003, (2) result in comparable short term cost, (3) cause a substantial increase in overall program cost and (4) involve greatly increased program risk.

See p. 32.

The draft report suggests reallocation of work and expansion of current manufacturing relationships to sustain the industrial base. The GAO provides no cost analysis to support that suggestion. The restructuring would have a large cost, yet no allowance is made for potential offset of the $9 billion in near term cost avoidance proposed by the GAO.

See pp. 31-32.

All three of the GAO draft report alternative shipbuilding options fail to assume realistic costs. For example, the draft report suggests that a lead ship NSSN can be constructed for the current nominal projected lead ship design and construction cost of $2.8 billion following a shipbuilding hiatus of 6 to 7 years. Historical data shows that radically altered shipbuilding rates in lean production environments have a dramatic effect on program costs. Nonetheless, the options cited in the GAO draft report fail to take into account inflation effects, the design and construction learning curves and loss of learning effects, variation in overhead expenses as the shipyards deal with changing backlog and periods of no new orders, the wide variation of material costs over the construction of the class of ships, and construction inefficiencies caused by ramping up or down of the construction workforce. In summary, the overly simplified cost evaluations presented for each of the shipbuilding alternatives in the GAO draft report are misleading and inaccurate.

See pp. 26 and 32.

With regard to the threat variable, the draft report does not adequately address the current and future threat in determining force structure alternatives. New generation nuclear and diesel-electric submarines pose a significant challenge to SSN-688/688I class submarines. To counter that emerging threat, a portion of the submarine force must include submarines with more capability and SEAWOLF level of stealth. The "Submarine Force for the Future Plan" prepared by the Joint Chiefs of Staff in 1993 and accepted by the Navy, specifies a force structure of SEAWOLF or NSSN-type submarines to meet the threat. Some of the alternatives proposed in the GAO draft report do not satisfy the need identified by the Joint Staff.

To counter the threat, the New Attack Submarine (NSSN) program, with lead ship authorization in FY 1998, was approved by the Defense Acquisition Executive following a Milestone I Defense Acquisition Board meeting on August 1, 1994. Further, the NSSN program is fully funded by the President's FY 1995 Budget. The DoD has sent a strong signal of commitment to the FY 1998 start of the NSSN program and to the low rate production option of sustaining the submarine industrial base.

The DoD appreciates the opportunity to comment on the GAO draft report.

Sincerely,

George R Schneiter

George Schneiter
Acting Director
Tactical Warfare Programs

Major Contributors to This Report

National Security and International Affairs Division, Washington, D.C.

Jess T. Ford, Associate Director
Frederick A. Bigden, Jr., Assistant Director
Fred P. Fenstermaker, Evaluator-in-Charge
Blanche Jackson, Evaluator
Joseph P. Raffa, Evaluator
James K. Seidlinger, Evaluator

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 6015
Gaithersburg, MD 20884-6015

or visit:

Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000 or by using fax number (301) 258-4066, or TDD (301) 413-0006.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (301) 258-4097 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

United States
General Accounting Office
Washington, D.C. 20548-0001

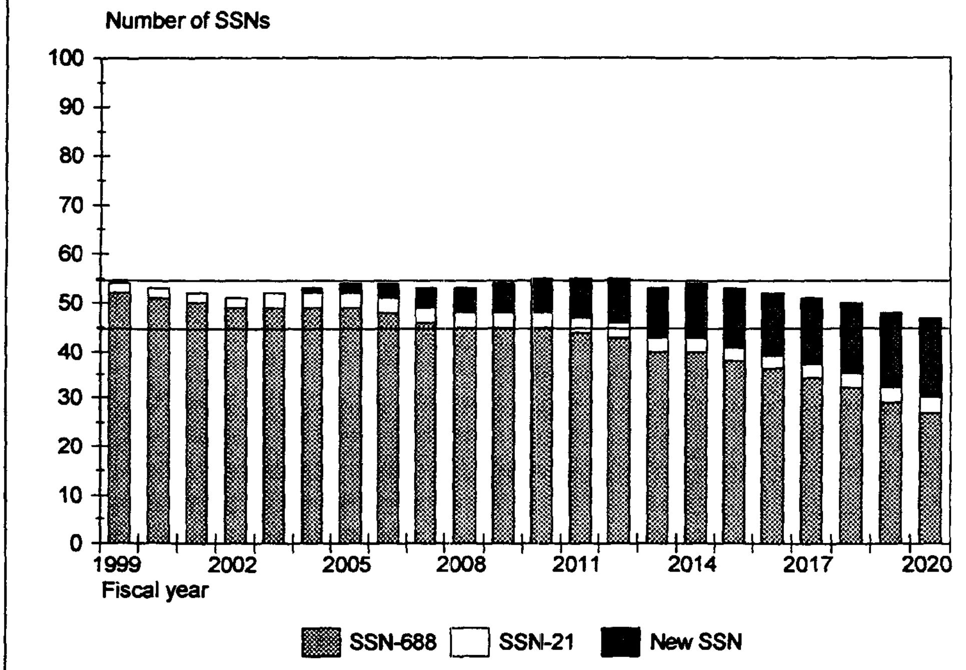
Bulk Mail
Postage & Fees Paid
GAO
Permit No. G100

from the SSN-688s' midpoint overhauls could be used in an assessment of the feasibility of a service life extension. In addition, both SSN shipbuilders agree that conducting various destructive and nondestructive metallurgical tests on retiring submarines would be useful for determining the validity of the submarines' operational life prediction models and their actual conditions. Navy officials said, however, that (1) it would be premature to begin a study before 1998 at the earliest, when the SSN-688s near the end of their design life, and (2) the Navy plans no such study for the SSN-688 class. The Navy has begun to study an extension from 30 to 40 years of the service life of its Nuclear-Powered Ballistic Missile Submarine (SSBN)-726 Ohio class (Trident) submarine, which entered the fleet 5 years later than the SSN-688.

If the SSN-688's service life could be extended and the Navy chose to operate the submarines longer than 30 years, substantial procurement savings would be possible through 2014. The 18 SSN-688 class submarines that will be refueled at their mid-life could make good candidates for a service life extension because they could operate for nearly 30 years after the refueling. We analyzed the effect on the force structure of extending the service life of the 18 refueled SSN-688s, assuming that the refueled SSN-688s would operate for one additional operating cycle. After these submarines serve for 30 years, they could undergo a 2-year overhaul and serve for one more 10-year operating cycle, for a total service life of 42 years. We found that extending the service life of the newer 9 refueled SSN-688s was a more cost-effective alternative than extending the service life of all 18 refueled SSN-688s.

We estimated that the cost for the additional overhaul of SSN-688 class submarines would be about $406 million. If the service life of the 9 SSN-688s was extended to 42 years, SSN procurements from 1996 through 2014 could be reduced from 31 to 17. At $1.5 billion per submarine, the Navy could save about $21 billion in procurement costs. However, the cost of extending the service life of the nine SSN-688 class submarines would be about $3.7 billion, reducing the overall savings to about $17.3 billion. Also, after 2020, submarine procurements would have to be increased to 2 or 3 per year to maintain the minimum 45-SSN force level. Figure 3.3 shows the effects on the force structure of operating nine of the refueled SSN-688s for an additional 120-month operating cycle.

Figure 3.3: Effects on SSN Force Levels of Extending the Service Life of Nine Refueled SSN-688s (1999-2020)



DOD Comments and Our Evaluation

DOD agreed that buying fewer submarines would cost less, but indicated that lower procurement rates would increase unit costs. The alternative plan presented satisfies the bottom-up review's minimum 45-SSN force level, providing a less costly alternative during times of reduced defense budgets. DOD officials said that procurement savings could be reduced by as much as $1 billion due to the higher unit costs caused by building 25 SSNs versus the 31 planned by the Navy. If service life extension proves feasible, it also provides an opportunity to buy fewer submarines later in the program, although unit costs again may be higher. The two alternatives presented both satisfy DOD's industrial base concerns by continuing low-rate production and defer higher SSN production rates (three per year) until after 2014. The Navy's plan will require this higher production rate beginning in 2011.

DOD commented that we did not adequately address the current and future threat. However, like the Navy's shipbuilding plan, the alternative plans in this chapter meet the Joint Chiefs' requirement for more capable submarines by 2012.

Alternative Acquisition Strategy Available to Navy

The confluence of reductions in the SSN force structure and the extension of the SSN-688's service life affords the Navy an opportunity to choose an alternative SSN acquisition strategy. The Navy could defer SSN construction until early in the next century and build the submarines in larger numbers when production resumes. Using this strategy, the Navy could free up billions of dollars in near-term shipbuilding funds required for planned SSN construction. However, some uncertain reconstitution costs would reduce the $9 billion savings that the Navy could achieve by building 25 submarines versus 31 as the Navy plans (as discussed in ch. 3). Depending on the assumptions used regarding closing, maintaining, and restarting shipbuilder facilities; hiring and retraining personnel; and shipbuilder workloads, reconstitution costs could range from less than $1 billion to as much as $6 billion.

New Attack Submarines Are Not Needed Until the Next Decade

In February 1994, the Secretary of Defense testified that DOD has no force structure need to build new submarines until after the turn of the century. New SSN construction can be deferred because the Navy can maintain the minimum force structure with its current fleet until 2012; that is, the force level would not fall below the minimum required 45-SSN level until 2012. Deferring new construction can free up billions of dollars in planned construction costs in the near term. As an illustration of the potential for deferring SSN construction, we analyzed an alternative in which construction is deferred until 2003. We assumed that construction of the submarines would take 5 years, which is how long the Navy estimates new attack submarine construction will take. However, we lengthened construction time for the first two SSNs to 7 and 6 years, respectively, to account for the additional time needed to build the first submarine of a class and any extra effort required to restart production after a hiatus. We believe that using 7 and 6 years is reasonable because a recently issued RAND report[1] noted that 6 years was required to deliver the first submarine after restarting submarine production at Newport News Shipbuilding, assuming construction of the funded aircraft carrier, CVN-76. Although SSN unit costs would vary based on the number of SSNs bought, we used the same procurement costs as the Navy's current estimates for the new attack submarine program because OSD and the Navy did not provide alternative unit costs. Table 4.1 shows the production rate and cost of the deferral scenario.

[1]The U.S. Submarine Production Base: An Analysis of Cost, Schedule, and Risk for Selected Force Structures, RAND (Santa Monica, CA., 1994).

Table 4.1: Deferred SSN Shipbuilding Plan and Estimated Costs

Fiscal year 1998 dollars in billions

Fiscal year	Quantity	Cost
1996-2002	0	0
2003	1	$3.1
2004	0	0
2005	1	1.5
2006	1	1.5
2007	2	3.0
2008	2	3.0
2009	3	4.5
2010	3	4.5
2011	3	4.5
2012	3	4.5
2013	3	4.5
2014	3	4.5
Total	**25**	**$39.1**

Compared to the Navy's September 1993 SSN shipbuilding plan, this alternative would save about $9 billion in procurement costs through 2014. Also, this alternative defers as much as $9 billion in planned SSN construction funding from 1996 to 2002. However, savings would be offset by reconstitution costs.

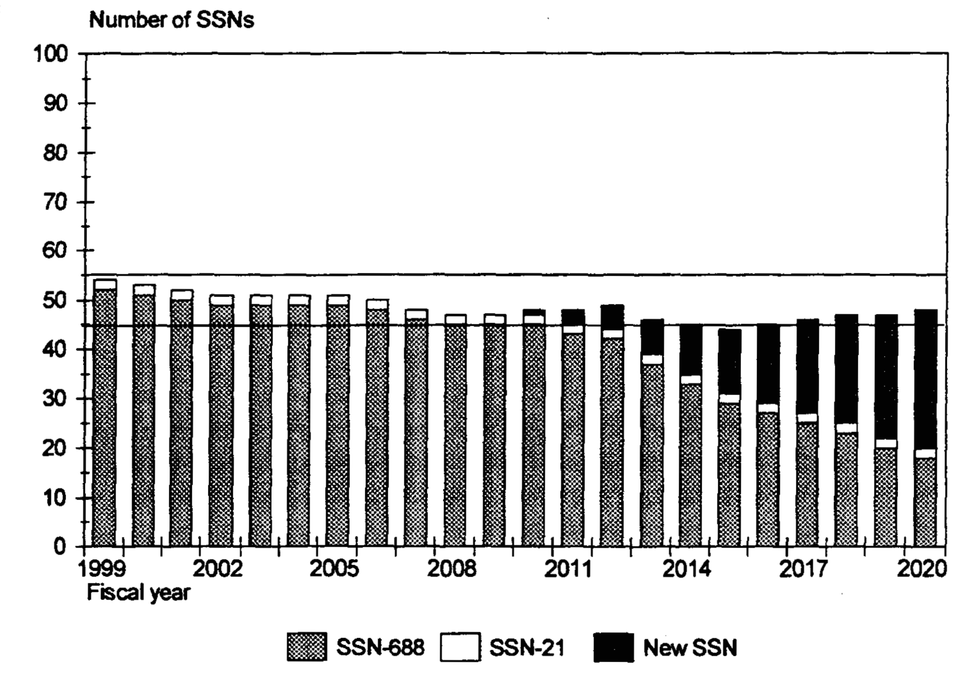
The 1994 RAND report, which evaluated the U.S. submarine production base, shows that reconstitution costs are highly dependent on assumptions regarding closing, maintaining, and restarting shipbuilder facilities; hiring and retraining personnel; and shipbuilder workloads. According to the report, shipbuilder facilities and personnel reconstitution costs are estimated at $800 million to $2.7 billion.[2] The $800 million estimate is based on the Navy beginning to build CVN-76 at Newport News Shipbuilding in 1995 and then restarting submarine production in 2003. The $2.7 billion represents RAND's estimate to restart submarine production at Electric Boat in 2003. Further, Navy officials cited a Navy industrial base study estimate of $4 billion to $6 billion for reconstitution coats, including vendor costs.

Even with a deferral of SSN construction and a reduction in the number of submarines built, the Navy can still support its required SSN force

[2]The RAND report used fiscal year 1992 dollars.

structure. Figure 4.1 shows the force structure implications of deferring SSN construction to 2003 and building at the rate shown.

Figure 4.1: SSN Force Structure Under a Deferred Acquisition Scenario (1999-2020)



Deferring SSN construction has budgetary risks. If construction is deferred until 2003, the average annual production rate would increase from about 1.5 SSNs to about 3 SSNs. These higher production rates would force the Navy to sustain higher annual shipbuilding budgets than it currently plans once SSN construction resumed.

SSN Construction to Continue for Industrial Base Reasons

DOD decided to build the SSN-23 in 1996 and commence with new SSN construction in 1998 at Electric Boat to support the nuclear shipbuilding industrial base. The United States has two nuclear shipbuilders: Electric Boat, which builds submarines and Newport News Shipbuilding, which builds aircraft carriers and submarines. In the bottom-up review, DOD considered consolidating nuclear shipbuilding at Newport News Shipbuilding. This would have eliminated the need to build the SSN-23 before the commencement of new SSN construction. Newport News Shipbuilding could shut down construction of nuclear submarines and still preserve the capability to resume production in the future because much of the shipbuilder's skilled workforce would continue building nuclear-powered aircraft carriers. An official from the shipbuilder reported that aircraft carrier production would account for 69 to 92 percent of the specialized job areas and skills needed for submarine construction. These percentages would increase from 95 percent to 100 percent if the shipbuilder also overhauled and refueled SSNs.[1] According to the bottom-up review, consolidating construction at Newport News would save the Navy about $1.2 billion after accounting for about $625 million of shutdown/reconstitution costs during the future years defense program period.

DOD determined that the Navy needs to retain both nuclear shipbuilders for industrial base and national security reasons. To support DOD's decision, Electric Boat will continue to build nuclear-powered submarines, while Newport News Shipbuilding will build nuclear-powered aircraft carriers. This decision is based on DOD's belief that given the uncertain world situation, it is too risky to have only one provider for both nuclear-powered aircraft carriers and submarines. Unless DOD changes its policy to retain the two shipbuilders, the alternative of deferring SSN construction may not be feasible.

Our analysis shows that either shipbuilder can meet the Navy's SSN shipbuilding requirements. Both nuclear-capable shipbuilders have the capacity to build at least three Seawolf-size submarines per year and can build a larger number of smaller submarines. The new attack submarine class is planned to be at least 20 percent smaller than the Seawolf class. Under either the Navy's shipbuilding plan or a deferred construction acquisition strategy, either shipbuilder could meet the Navy's SSN construction needs.

Effect of Construction Deferral on Critical Industrial Vendors Is Unclear

The Navy has stated that if no submarine is built before the start of the new class of attack submarines in 1998, several critical submarine vendors will be lost. However, OSD and the Navy lack uniform criteria for

[1]Currently, naval shipyards at Puget Sound, Washington; Mare Island, California; Pearl Harbor, Hawaii; Portsmouth, New Hampshire; Norfolk, Virginia; and Charleston, South Carolina, overhaul and refuel SSNs.

determining what constitutes a critical vendor, and the Navy may not be considering the availability of alternate suppliers.

According to OSD, a vendor is critical if no alternate sources or substitutes are available or can reasonably be developed and still meet long-term defense needs. The Navy, however, considers some vendors critical even when alternate sources are available. For example, although OSD has identified 8 critical suppliers of nuclear and nonnuclear submarine components, the Naval Sea Systems Command has identified 49 critical vendors of nonnuclear components alone, and the Seawolf program office has identified 63 critical nonnuclear vendors.

Evidence shows that the Navy has not fully considered alternative sources to the vendors it considers critical. For example, of the products produced by 49 vendors considered critical by the Naval Sea Systems Command, if no more than two Seawolf class submarines are built, a majority are available from multiple vendors or from single-source vendors for which alternate suppliers exist. Furthermore, the Navy could create new or expand existing relationships with the SSN shipbuilders and government-owned laboratories to compensate for the loss of commercial industrial skills. For example, in the past the SSN shipbuilders have been forced to produce submarine components that vendors stopped producing. When Newport News Shipbuilding lost its sole-source manufacturer of torpedo tubes, it began producing torpedo tubes. Newport News Shipbuilding officials stated that they can now produce the tubes faster and at less cost than the vendor could. The Navy could also rely on government laboratories like the Department of Energy's Y-12 facility at the Oak Ridge National Laboratory and the Kansas City Plant, both of which already produce components for Navy submarine-related programs. For example, the Y-12 facility is responsible for machining and assembling the SSN-21 propulsor.

DOD Comments and Our Evaluation

DOD nonconcurs with the deferral strategy presented in this chapter because it believes that deferring construction would (1) cause SSN unit costs to rise, (2) result in the loss of the submarine shipbuilding industrial base, and (3) require billions of dollars to reconstitute the industrial base. DOD believes that low-rate submarine production is the preferable option for sustaining the submarine industrial base.

OSD and Navy officials disagreed with using the same SSN construction cost estimates for a strategy that defers construction to 2003 because the cost estimates were developed for a 30-SSN buy starting in 1998. Our estimate that the Navy could save as much as $9 billion by building 25 SSNs, versus the 31 SSNs the Navy plans to build, is based on notional cost estimates from the best information available; OSD and the Navy did not provide alternative cost estimates. We agree that the actual costs for the new attack submarine could be affected by design and construction learning curves, variation in overhead expenses, the wide variation of material costs, and construction inefficiencies caused by fluctuations in the construction workforce. Because of these factors, cost estimates become less certain over time. However, regardless of the unit cost, the alternatives presented in this report require building fewer submarines and should require less total funding than the Navy's current plans.

DOD commented that the deferral strategy does not adequately address the threat. However, this strategy meets the Joint Chiefs' requirement for more capable submarines in 2014, only 2 years later than required.

DOD believes that a construction deferral and subsequent reconstitution of the submarine industrial base would create an enormous management challenge and increase program risk. DOD commented that funds saved by deferring SSN construction would need to be spent during the deferral period to reconstitute the industrial base. Our report clearly states that deferring SSN construction to 2003 could defer the spending of as much as $9 billion in costs between 1996 and 2002. While we and DOD do not know the magnitude of the reconstitution costs, this alternative does offer the opportunity to defer near-term costs, which may be appealing during a period of reduced defense budgets. Further, the 1994 RAND report shows that the estimated reconstitution costs to restart submarine construction in 2003 are less than the potential $9 billion savings, suggesting that a deferral strategy is an alternative warranting further study.

In its comments, DOD acknowledged that OSD and the Navy had not thoroughly explored the expansion of current manufacturing relationships to sustain the industrial base, but argued that such a restructuring would have a large cost (although not estimated by DOD) that would offset near-term cost avoidance. However, expanding current manufacturing relationships might reduce the adverse effects on the submarine industrial base during a deferral and might reduce the time and funding required when reconstitution begins.

Organizations GAO Visited

The following is a list of the U.S. government organizations and private companies contacted during our review.

Department of Defense

Office of the Secretary of Defense, Washington, D.C.

- Assistant Secretary of Defense for Program Analysis and Evaluation, General Purpose Forces, Naval Force Division

Office of the Chairman, Joint Chiefs of Staff, Washington, D.C.

- Force Structure, Resource, and Assessment Directorate

Defense Intelligence Agency, Washington, D.C.

Advanced Research Projects Agency, Arlington, Virginia

Department of the Navy

Office of the Assistant Secretary of the Navy (Research, Development and Acquisition), Washington, D.C.

- Program Executive Officer, Submarine Programs

Office of the Chief of Naval Operations, Washington, D.C.

- Assistant Deputy Chief of Naval Operations for Undersea Warfare, Attack Submarine Division

Commander in Chief, U.S. Atlantic Fleet, Norfolk, Virginia

- Commander, Submarine Forces Atlantic
- Commanders, Submarine Squadrons 6 and 8, Naval Submarine Forces, U.S. Atlantic Fleet, Norfolk, Virginia
- Chief of Staff, Submarine Squadron 4, Naval Submarine Forces, U.S. Atlantic Fleet, Charleston, South Carolina
- Commanding Officer, USS Albany (SSN-753), U.S. Atlantic Fleet, Norfolk, Virginia
- Director, Special Surveillance and Commander, Task Force 84 Operations, U.S. Atlantic Fleet, Norfolk, Virginia

Naval Sea Systems Command, Washington, D.C.

- Deputy Commander for Nuclear Propulsion
- Deputy Commander for Submarines
  - Submarine Safety and Quality Assurance Division
  - Program Manager, SSN-688 Ship Acquisition Program Office, Arlington, Virginia
  - Submarine Maintenance Engineering, Planning and Procurement Activity, Portsmouth, New Hampshire
- Deputy Commander for Industrial and Facility Management
  - Industrial Planning Division
  - Puget Sound Naval Shipyard, Bremerton, Washington
  - Portsmouth Naval Shipyard, Kittery, Maine
  - Mare Island Naval Shipyard, Vallejo, California
  - Charleston Naval Shipyard, Charleston, South Carolina

Office of Naval Intelligence, Suitland, Maryland

Department of Energy

Office of Technology Utilization, Washington, D.C.

Y-12 Plant, Oak Ridge, Tennessee

Kansas City Plant, Kansas City, Missouri

Other Organizations and Companies

Babcock and Wilcox, Nuclear Equipment Division, Barberton, Ohio

Electric Boat Division, General Dynamics Corporation, Groton, Connecticut

Marine Mechanical Corporation, Cleveland, Ohio

Newport News Shipbuilding and Dry Dock Company, Tenneco Corporation, Newport News, Virginia

Westinghouse Electro-Mechanical Division, Cheswick, Pennsylvania

Congressional Research Service, Washington, D.C.

U.S. SSN Characteristics

Submarine Characteristics

The Navy claims that a submarine's unique combination of stealth, endurance, and agility gives it a critical advantage over other weapons. A submarine's stealth is derived from its ability to submerge and become essentially invisible and undetectable. Nuclear propulsion allows submarines to remain submerged 24 hours a day. Nuclear propulsion also gives a submarine endurance because the ship's nuclear fuel lasts for many years of operation. The endurance of a nuclear-powered submarine is limited only by the crew's food supply and weapons expenditures. Endurance provides submarines the advantages of continuity and independence. The Navy defines submarine agility as the ability to proceed quickly where needed, often before other forces, and respond to a broad range of situations. A submarine's agility results from (1) nuclear propulsion, which allows unlimited high speed operation; (2) multiple mission capability; and (3) ship- and shore-based command, control, and communications systems.

Current U.S. SSN Programs

In fiscal year 1994, the U.S. Navy operated 87 SSNs: 54 SSN-688 Los Angeles class submarines and 33 SSNs of older classes. The Navy is currently building two classes of SSNs: the SSN-688 Los Angeles class and SSN-21 Seawolf class.

Los Angeles Class (SSN-688)

The SSN-688 class, introduced into the fleet in 1976, will be the mainstay of the Navy's SSN force well into the next century. By 1996, 62 SSN-688s will have been built to make up the entire class. While all SSN-688 submarines are capable of firing the Tomahawk cruise missile, the last 31 submarines were equipped with vertical launch tubes for these missiles. Older class submarines launch cruise missiles through their torpedo tubes. The final 23 SSNs of the SSN-688 class are improved versions of the original SSN-688 design (SSN-688Is). Among the changes to the SSN-688 class are improved sound quieting and an improved sonar. Also, replacement of the sail-mounted control planes with control planes attached to the bow allows SSN-688Is to surface through arctic ice. The last SSN-688s cost the Navy approximately $800 million in then-year dollars. The Navy has estimated that SSN-688 procurement could be restarted and two submarines built for approximately $2.4 billion in current dollars.

Seawolf Class (SSN-21)

Two Seawolf class submarines are now being built, with the first to be delivered in 1996 and the second to be delivered in 1998. The Seawolf is designed to be substantially quieter than the SSN-688 class and have better sonar and combat systems. According to the Navy, the Seawolf will have three times as much capability as the SSN-688. When the program began, the Navy justified construction of the Seawolf largely on the need to counter the improved Soviet submarines that were expected to appear in the future.[1] While two Seawolf class submarines are under construction, the bottom-up review directed building a third Seawolf to sustain the submarine shipbuilding industrial base during the gap between the end of SSN-22 construction and the beginning of the new attack submarine construction program. The SSN-21 was funded in fiscal year 1989 at a cost of $1.9 billion, while the SSN-22 was funded in fiscal year 1991 at a cost of $1.8 billion. The Navy currently estimates the SSN-23 will cost $1.5 billion more in fiscal year 1996 dollars than the $900 million already appropriated.

New Attack Submarine

In early 1991, the Navy began to plan for a new attack submarine to replace the truncated Seawolf program. This program has previously been known as the Centurion. Although no final decision has been made about which new attack submarine design will be built, the Navy expects it to be as quiet as the Seawolf but smaller, generally less capable, and less costly. In August 1992, the Under Secretary of Defense for Acquisition approved concept definition studies for the new attack submarine. A cost and operational effectiveness analysis, which analyzes the comparative cost-effectiveness of new attack submarine alternatives, was completed in September 1993. As a result of the Defense Acquisition Board's review on January 12, 1994, the Navy studied a number of alternative SSN building programs and their impact on the industrial base. On August 1, 1994, the Defense Acquisition Board met to review an initial acquisition strategy for the new attack submarine (Milestone I) and approved Phase I design efforts focused on construction of a lead ship in fiscal year 1998. The cost and operational effectiveness analysis estimated that the first new attack submarine would likely cost $3.1 billion and follow-on submarines would cost $1.5 billion.[2]

[1]Initially, the Navy planned to procure 29 Seawolf class submarines; after the 1991 major warship review, that number was reduced to 12. After three Seawolfs had been authorized, the Bush administration proposed that the number be further reduced to 1; however, Congress funded the second Seawolf (SSN-22).

[2]The analysis presented the cost estimates in constant fiscal year 1994 dollars: $2.8 billion for the lead ship and $1.5 billion for 29 follow-on ships.

Present Value Analysis

Investment alternatives normally involve incurring different costs at different times. For two or more alternatives to be compared on an equal economic basis, taking into account the time value of money, the costs of each alternative at its "present value" must be considered. We did an analysis to determine the present value of funding required by different SSN shipbuilding alternatives. Discounting, which reduces a stream of future funding requirements to a single amount (a present value), attaches greater weight to more current costs and less weight to future costs. By using present value techniques, we converted future dollar funding into their value in 1994. A present value analysis makes each alternative's funding comparable despite the differing funding profiles for each alternative.

Although present value analysis is a generally accepted practice, selecting an appropriate discount rate has been the subject of much controversy. For federal government investment analysis and decision-making, arguments have been presented for discount rates ranging from the cost of borrowing by the Treasury to the rate of return that can be earned in the private sector. Since the Treasury meets most government funding requirements, we maintained that its estimated cost to borrow was a reasonable basis for the discount rate used in present value analysis. Accordingly, for our analysis, we used the average yield on outstanding marketable Treasury obligations that had remaining maturities similar to the time period involved in our analysis. We subtracted a 20-year average of the projected gross domestic product deflator from the average yield on outstanding marketable Treasury obligations and applied the resulting real discount rate to the 1994 constant dollar funding values. Table III.1 shows our present value analysis.

Table III.1: Constant Dollar and Present Value Analysis of Funding Profiles for SSN Shipbuilding Alternatives for Fiscal Years 1996-2014

Dollars in billions

SSN shipbuilding alternative	Funding (constant 1998 dollars)	Present value of funding
Navy plan (31 SSNs)[a]	$48.2	$24.8
Alternative plan (25 SSNs)[b]	39.2	20.9
Deferred plan (25 SSNs)[c]	39.1	17.5

[a]The Navy plan's funding profile is presented in table 3.1.

[b]The alternative plan's funding profile is presented in table 3.2.

[c]The deferred plan's funding profile is presented in table 4.1.

Under the alternative plan, the stream of funding requirements begins almost right away (1996), with the program's reduced buy of 25 SSNs spread out fairly evenly over the 1996-2014 time interval. Under the deferred plan, the stream of funding requirements does not begin until 2003; the bulk of the 25 SSNs would be bought toward the end of the 1996-2014 time interval. Also, estimated reconstitution costs, which range from $800 million to $6 billion, would raise the deferred plan's total funding and its present value.

Comments From the Department of Defense

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

ACQUISITION AND TECHNOLOGY

19 AUG 1994

Mr. Frank C. Conahan
Assistant Comptroller General
National Security and International
Affairs Division
United States General Accounting Office
Washington, D. C. 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report "ATTACK SUBMARINES: Alternatives for a More Affordable SSN Force Structure," dated July 27, 1994 (GAO Code 394493), OSD Case 9746. The DoD nonconcurs with the report.

The draft GAO report presents several alternative shipbuilding profiles. Those profiles include (1) building a reduced number of nuclear-powered attack submarines (SSNs), (2) extending the service life of selected SSN-688 submarines, and (3) deferring all submarine production until FY 2003. Although the DoD agrees with certain aspects of the alternatives, none is supported by the DoD.

See p. 22.

With regard to the first GAO alternative, the final GAO force structure level is six submarines less than the Navy plan. The draft report compares a Navy force size of 51 with a GAO force level of 45. The DoD agrees that procuring a smaller submarine force will cost less. A more meaningful analysis, however, would be a comparison of costs for different acquisition profiles of an equal force size. In that comparison, the most affordable acquisition profile for attaining a given SSN force level could be ascertained. The DoD also does not agree with the cost savings presented by the GAO for the smaller force size because the GAO analysis does not take into account the change in per-ship cost associated with lowering procurement rates in a lean production environment.

See pp. 26, 31, and 32.

See p. 24.

With regard to the second option, the DoD agrees that if it is determined that the 688 class service life can be significantly extended, then future SSN procurement requirements may be able to be reduced. However, that is a technical decision and the analysis required to support the decision will not be available until several years after an initial procurement decision on the New Attack Submarine (NSSN) is required. The DoD and GAO agree on this point. However, the DoD nonconcurs with the cost savings presented by the GAO because again, the GAO

See pp. 26, 31, and 32.

analysis does not take into account the increased costs associated with lower procurement rates.

The DoD also nonconcurs with regard to the GAO option of deferring all SSN production until FY 2003. The GAO concludes that billions of dollars of near term cost avoidance could be realized by deferring altogether, attack submarine construction over the next decade. That opinion however, is not supported by various DoD studies, which concluded that low rate submarine production is the preferable option for sustaining the submarine industrial base.

See pp. 27-32.

In formulating a plan for maintaining SSN force levels as affordably as possible, several interdependent variables must be studied and optimized. Those variables include: (1) the submarine industrial base, both production and design, (2) overall program costs based on realistic annual budgetary estimates, and (3) the number and quality of ships needed to meet the potential threat into the next decade. A discussion of each variable in relation to the GAO draft report follows.

First, the preservation of the submarine industrial base, including both the design/engineering and production bases, is pivotal in any discussion of affordably maintaining the SSN force structure. The submarine design and engineering base includes scientists at Federally funded centers, technologists at laboratories, shipbuilders, and vendors, and design and engineering talent both in industry and in the Government. Because those technologies are so highly specialized, the industrial base is heavily dependent on continuity of submarine design and construction work.

There are two basic approaches which could be used to preserve an industrial base able to build submarines. The first would be to fund a recapitalization effort through sustained low rate submarine production. That approach would enable vendors and shipbuilders to make the capitol investment necessary to down-size and make cost effective low-rate production possible. That is the approach favored by the DoD.

The second approach would involve a wholesale shutdown of the industrial base, a period of no production, and then a restart of the design and production bases. This is one of the options referred to in the GAO draft report. The complete shutdown/startup approach would involve an enormous management challenge and would result in substantially increased program risk. No industrial base reconstitution of that magnitude and complexity has successfully been accomplished. Depending on the assumptions made, the shutdown/restart approach, if it were possible, could result in some near term cost avoidance, but would inevitably be much costlier in the long run. The GAO draft report does not address the costs associated with the shutdown and startup effort. The vendor base has been removed from the GAO analysis based on "lack of agreement" (between the OSD and

See p. 32.

See p. 6.

the Navy) over what constitutes a critical vendor. While vendor characterization is a subject of some discussion, both the Navy and the OSD agree that all submarine-unique component vendors will lose their submarine component design and production capabilities given the six year gap in submarine awards proposed in the GAO draft report. The near term costs which would be associated with the shutdown/startup proposal form the very basis of the financial arguments for choosing the low rate production alternative. Since shutdown and startup costs and risks are not included in the GAO analysis, no meaningful comparison between the two alternatives is possible.

See p. 6.

Another difficulty with the deferral of all attack submarine production until FY 2003 would be that unreasonably high production rates that would be required, once SSN construction were resumed, in order to maintain the SSN force level. Even under the current Navy plan, a production rate of three submarines per year will be required for more than five consecutive years (between FY 2010 and FY 2020) in order to maintain a 45 SSN force level. That represents an unprecedented percentage of total Navy ship construction funding devoted to submarine construction. By deferring another four or five submarines until FY 2003, an already difficult situation would be made much worse. Although the GAO draft report mentions that higher production rates would be required under the shutdown/restart option, it fails to evaluate the impact that action would have on the production plan. Planning for such unreasonably high out-year production rates would threaten the ability to maintain a 45 SSN force level.

See pp. 31-32.

Concerning the issue of program costs, the GAO suggests that "savings" of $9 billion are possible by deferring SSN construction. Actually, the figures cited represent "near term cost avoidance," rather than "cost savings" as stated in the draft report. Clearly, any deferral plan which builds the same number of ships will be costlier in the long run than the DoD plan. In addition, the near term cost avoidance figures cited by the GAO draft report did not account for the substantial expenses of shutdown and reconstitution or the increased cost of production which would result from reduced building profiles or production delays.

See p. 32.

The shutdown/reconstitute approach was studied by the Navy in 1992, and more recently by the Rand Corporation. The Navy study concluded that at least $4 to $6 billion would be required to shutdown and start up the industrial base. The RAND Corporation study determined that the cost avoidance of deferring production would be comparatively small, and advocated a minimum gap strategy. Even if near term costs of an industrial base shutdown could be shown to be somewhat less than those associated with steady low rate submarine production, the low rate production option would still be preferable because submarines would be produced while sustaining the industrial base. In contrast, the industrial base shutdown/restart option would

THE U.S. SUBMARINE PRODUCTION BASE

An Analysis of Cost, Schedule, and Risk for Selected Force Structures

EXECUTIVE SUMMARY

John Birkler, John Schank, Giles Smith, Fred Timson, James Chiesa, Marc Goldberg, Michael Mattock, Malcolm MacKinnon

National Defense Research Institute

RAND

The research described in this report was sponsored by the Office of the Secretary of Defense under RAND's National Defense Research Institute, a federally funded research and development center supported by the Office of the Secretary of Defense, the Joint Staff, and the defense agencies, Contract MDA903-90-C-0004.

Library of Congress Cataloging in Publication Data

The U.S. submarine production base : an analysis of cost, schedule, and risk for selected force structures : executive summary / John Birkler ... [et al.].
p. cm.
"Prepared for the Under Secretary of Defense for Acquisition and Technology."
"MR-456/1-OSD."
ISBN 0-8330-1587-7
1. Submarine boats—United States. 2. Navy—yards and naval stations—Economic aspects—United States. 3. United States. Navy—Submarine forces. 4. Shipbuilding industry—United States. 5. Defense industries—United States. I. Birkler, J.L., 1944– . II. United States. Office of the Under Secretary of Defense for Acquisition and Technology. III. Title: US submarine production base.
V858.U213 1994
359.9´3´0973—dc20 94-32570
CIP

Cover design: Corinne Maiers

Published 1994 by RAND
1700 Main Street, P.O. Box 2138, Santa Monica, CA 90407-2138
To order RAND documents or to obtain additional information, contact Distribution Services: Telephone: (310) 451-7002; Fax: (310) 451-6915; Internet: order@rand.org.

THE U.S. SUBMARINE PRODUCTION BASE

An Analysis of Cost, Schedule, and Risk for Selected Force Structures

EXECUTIVE SUMMARY

John Birkler, John Schank, Giles Smith, Fred Timson, James Chiesa, Marc Goldberg, Michael Mattock, Malcolm MacKinnon

Prepared for the
Office of the Secretary of Defense

National Defense Research Institute

RAND

PREFACE

In January 1993, RAND's National Defense Research Institute was asked by the Office of the Under Secretary of Defense for Acquisition (now Acquisition and Technology) to compare the practicality and cost of two approaches to future submarine production: (1) allowing production to shut down as currently programmed submarines are finished, then restarting production when more submarines are needed, and (2) continuing low-rate production. The research was motivated by concerns that the submarine production base might not be easily reconstituted if production is shut down and by the countervailing recognition that deferring new submarine starts might yield substantial savings, particularly over the short term.

This report summarizes RAND's analysis, the results obtained, and the associated uncertainties. The reader should bear in mind, of course, that in a summary such as this, completeness and precision are in some degree sacrificed for brevity. A full treatment of methods and results is available from RAND in MR-456-OSD.

RAND's analysis was completed and briefed to the research sponsors and other interested parties in the summer of 1993. It reflects what was known then about cost, schedules, and other relevant factors.

This research was carried out within the National Defense Research Institute's Acquisition and Support Policy Program (now the Acquisition and Technology Policy Center). The institute is a federally funded research and development center sponsored by the Office of the Secretary of Defense, the Joint Staff, and the defense agencies.

CONTENTS

FIGURES

ACKNOWLEDGMENTS

This work could not have been undertaken without the special relationship that exists between the Office of the Secretary of Defense (OSD) and RAND under the National Defense Research Institute (NDRI). For that relationship we are grateful. Many individuals in OSD and RAND deserve credit for the work discussed in this report. Their names and contributions would fill several pages. If we were to single out a senior person in OSD and another at RAND who participated in and supported this work in extraordinary ways, we would mention Gene Porter, Director, Acquisition Program Integration, and David Gompert, Director, NDRI.

We also want to thank the leadership and staff of the Office of the Secretary of Defense, the Office of the Secretary of the Navy, the Naval Sea Systems Command, the Navy Nuclear Propulsion Directorate, the Navy Program Executive Officer for Submarines, Electric Boat Division of General Dynamics, Newport News Shipbuilding, Mare Island Naval Shipyard, and Norfolk Naval Shipyard. The shipyards arranged for us to visit their facilities and gave us the opportunity to discuss production issues with those most directly involved. The shipyards and the Navy offices provided all the data we requested in a timely manner. We appreciate their sharing their perspectives with us and their treating differing perspectives in a professional manner.

We are also indebted to the British and French Ministries of Defense for allowing us to visit their headquarters and submarine production facilities and to discuss their experiences with production gaps, low-rate production, and production issues.

Finally, we are grateful to Joseph P. Large for his review of this document and to both Mr. Large and James A. Winnefeld for their reviews of the comprehensive report on which this summary is based. These reviews led to many improvements in both reports.

This broad-based participation made possible the analysis described here.

Chapter One

BACKGROUND

The current U.S. submarine production program is coming to an end.

Only two shipyards build submarines for the U.S. Navy—the Electric Boat Division of General Dynamics, with principal production facilities in Groton, Connecticut, and Newport News Shipbuilding, a Tenneco subsidiary, in Newport News, Virginia. Together, they employ about 17,000 workers in submarine construction. Thousands more work for vendors supplying nuclear and nonnuclear components to the shipyards.

After many years of building three or more submarines annually, these shipyards have started no new submarines since 1991. Figure 1 shows the number of submarines commissioned each year and, for years in the future, scheduled to be commissioned. By 1999, submarine deliveries will drop to zero for the first time in decades.

This study focuses on attack submarines (SSNs, represented by the darker bar segments in Figure 1). Figure 1 includes the ballistic-missile-carrying Ohio-class submarines (SSBNs), which serve as one leg of the nuclear-deterrent triad, to show that that construction program is coming to an end along with the one for attack submarines.

The United States now has plenty of attack submarines.

A result of the construction activity shown in Figure 1 is the attack submarine fleet profile shown in Figure 2. The current total is down some from the peak but about the same as it was in 1980, in the midst of the cold war.

The number of attack submarines *needed* in the post-cold war era is uncertain. Clearly, the United States will need *some:* Many nations—North Korea, Iran, Libya, others—have submarines, and attack submarines afford the United States a flexible resource in the new strategic environment. They are the chief

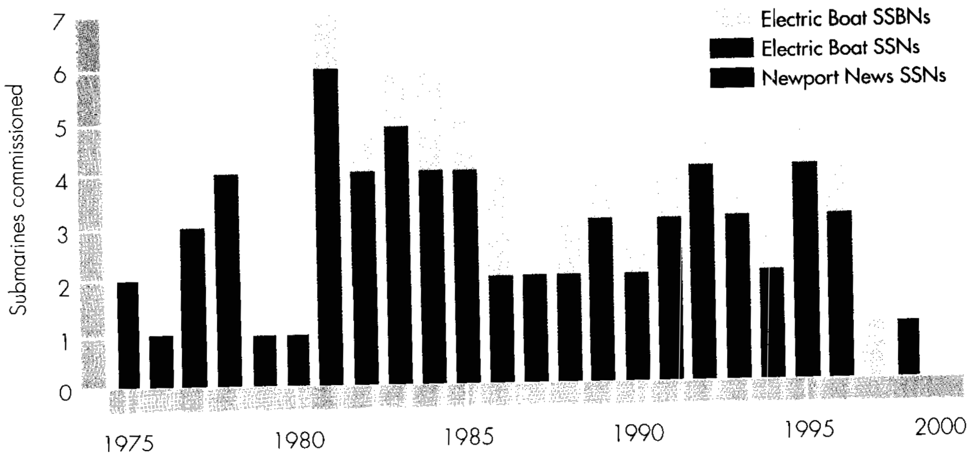


Figure 1—Recent U.S. Submarine Production

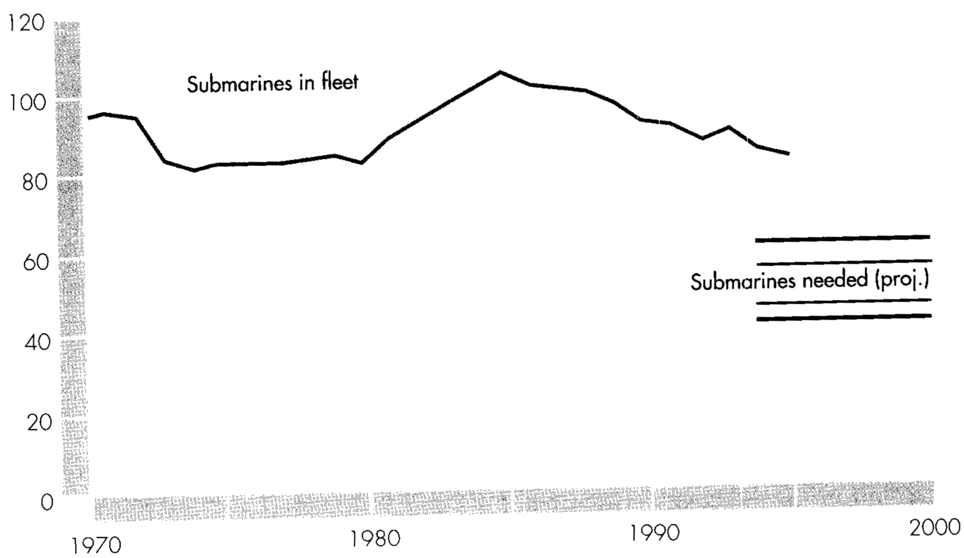


Figure 2—Attack Submarines in Fleet Compared with Number Needed

means of defending U.S. ships against enemy submarines, they can hold enemy surface ships at risk and attack land targets with cruise missiles, and they can transport special forces such as SEALs (sea, air, land teams). Furthermore, they can undertake these missions or position themselves to do so without calling attention to their presence; such stealth can be important if force projection is wanted but is undesirably provocative.

The Department of Defense's Bottom-Up Review suggests a post–cold war fleet of between 45 and 55 attack submarines. In Figure 2, we broaden the band by five ships (10 percent) in either direction to take into account the opinions of knowledgeable observers outside of DoD. But regardless of whether the requirement is 40 ships or 60 ships, the United States now has many more submarines than it needs. Why build more?

Eventually, it will be necessary to replace submarines now in the fleet.

Submarines, of course, do not last indefinitely. To ensure safe, reliable operation, submarines are retired from the force by the time they reach 30 years of service. As Figure 3 shows, the fleet will decline sharply in size as the older submarines built in the sixties are decommissioned—all by the year 2000. The first of the current class will reach age 30 in 2006. Shortly thereafter, the fleet will begin declining through the range of possible requirements, as ships con-

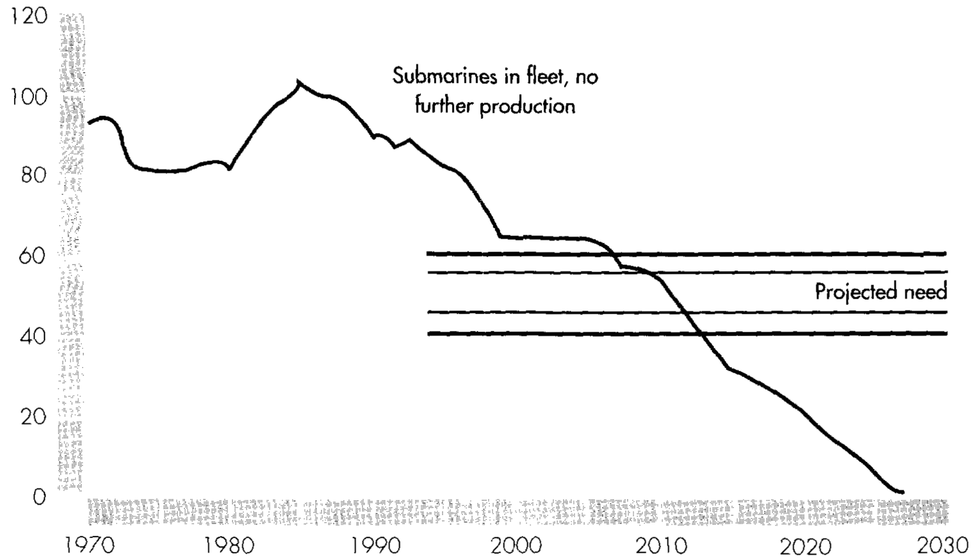


Figure 3—Projected Attack Submarine Fleet Profile with No Further Production

tinue to be retired at the rate at which they were built—about four per year. (Fleet replacement needs for SSBNs are more uncertain and, in any case, farther in the future than those for SSNs.)

By 2013, the attack submarine fleet will fall below the 40-ship level unless construction is started far enough in advance to have replacement boats ready. Because it now takes only six years to build a submarine, it may appear that there is adequate time for a money-saving gap in production. This, however, ignores an important issue.

Initiating a submarine construction program after a hiatus would face serious challenges.

Nuclear submarines are among the most complex structures built by man. Not only must they survive and function underwater for long periods of time in a hostile environment, they contain a nuclear reactor in immediate proximity to the crew. Despite these challenges, U.S. nuclear submarines have demonstrated their reliability in diverse conflict situations while maintaining an impressive safety record over almost four decades. That history can be credited in large part to the highly skilled submarine design, engineering, and construction workforce, both in the shipyards and at the factories of critical-component vendors.

The most recently started submarine is now three years into construction. Shipyard workers and component vendors needed only in the initial phase of construction are already dispersing or preparing to exit the business. More will leave as the industry shuts down in phases. If more submarines are not started soon, then rebuilding the workforce, reopening the shipyard facilities, and reestablishing the vendor base could be very costly and time-consuming. Reconstitution could also compromise the reliability and safety of submarines constructed before today's high standards are reattained.

We analyzed the production schedule, cost, and risk associated with postponing and with continuing production.

Motivated by the need to trade off costs and risks while meeting a fleet replacement schedule, the Deputy Secretary of Defense asked RAND to evaluate "the practicality and cost effectiveness of reconstitution of the submarine production base versus a continuing program for limited production." The two production options envisioned by the Deputy Secretary may be defined more specifically as follows:

- Wait to build more submarines until those coming out of the fleet must be replaced to maintain a sufficient force size. Then, build a new type of attack submarine. The expectation was that this approach might save money in the near term through postponement of production, but would run up extra costs—and risks—later, when it became necessary to restart production.
- Build another submarine of the Seawolf class—the latest class now under construction—while design work proceeds on the new attack submarine. Then start constructing ships of the new type as soon as practical. The effects on cost and risk were anticipated to be the opposite of those expected for the first option.

Our study thus had three purposes:

- To determine the practicality of extending the current gap between submarine starts, given the time required to restart production. We wanted to make sure we took into account the full potential advantages of deferring production. The advantages increase with the length of the gap—the longer production is put off, the more money should be saved. So we sought to find the longest gap possible that still allowed meeting force objectives.
- To compare the cost of producing submarines after the longest gap practical with that of continuing production. This is equivalent to determining which is greater—the savings from postponing production or the offsetting costs of shutdown and restart—and by how much.
- To characterize the largely unquantifiable risks involved in a reconstitution strategy.

In performing these tasks, we drew on quantitative data and qualitative information from private- and public-sector shipyards and vendors, relevant components of the U.S. Navy and the Office of the Secretary of Defense, and foreign governments with shutdown experience. Sources included persons with varying perspectives on the seriousness of the delays, costs, and risks associated with a production gap. We reviewed all data critically, made adjustments where we believed them appropriate, and built and ran analytical models to draw inferences where the nature of the data permitted them.

We ascertained how stopping and restarting production affects shipyard and vendor costs and schedules and how decisions about future fleet size and production rate determine the production gaps feasible. These results were then combined to yield discounted cost streams for sustaining the submarine production base under a strategy of continued production and under various postponement strategies. We accounted for the costs of producing, operating, and maintaining the attack submarine force until 2030, when submarines in the the current fleet will all have been replaced.

This is what we found.

- It takes so long to restart production after shutdown that **construction of the next class of submarines must be started by around 2001** if fleet sizes of 40 or more are to be sustained. (This finding is discussed in more detail in Chapter Two.)
- For the longest gaps feasible, the discounted stream of costs required to sustain the submarine force to 2030 results in **savings of less than a billion dollars** compared to the cost of a more continuous program. That is **well within the margin of error** with which we can now project such costs. (For details, see Chapter Three.)
- **Risks, however, are substantial.** Given the difficulties and challenges involved in restarting submarine production from scratch, there is a risk that our cost estimates for restart are too low and our schedule estimates too optimistic. Further risks related to nuclear licensing and environmental and safety concerns may jeopardize the success of a restarted nuclear submarine program. (See Chapter Four.)
- Considering the limited savings realizable and the substantial risks incurred in extended-gap scenarios, **we recommend that construction of additional submarines be started soon.** Specifically, we recommend that the third Seawolf-class submarine, now planned for a 1996 start, be funded, and that the Navy proceed with plans for beginning construction of the new attack submarine in the late 1990s. (See Chapter Five.)

Chapter Two

HOW LONG CAN PRODUCTION BE SUSPENDED?

The length of the gap depends on how big a fleet is desired.

The bigger the attack submarine fleet the United States seeks to sustain, the sooner the next submarine must be delivered, and the sooner construction must start. To aid in understanding the relation between force objective and production gap, in Figure 4 we have added a new-production curve (blue) to the no-production curve and the illustrative 40-ships-needed line from Figure 3. Because fleet size is affected by the timing of *delivery*, and not construction, the lessons here are in terms of delivery date; we then infer the latest possible construction start date.

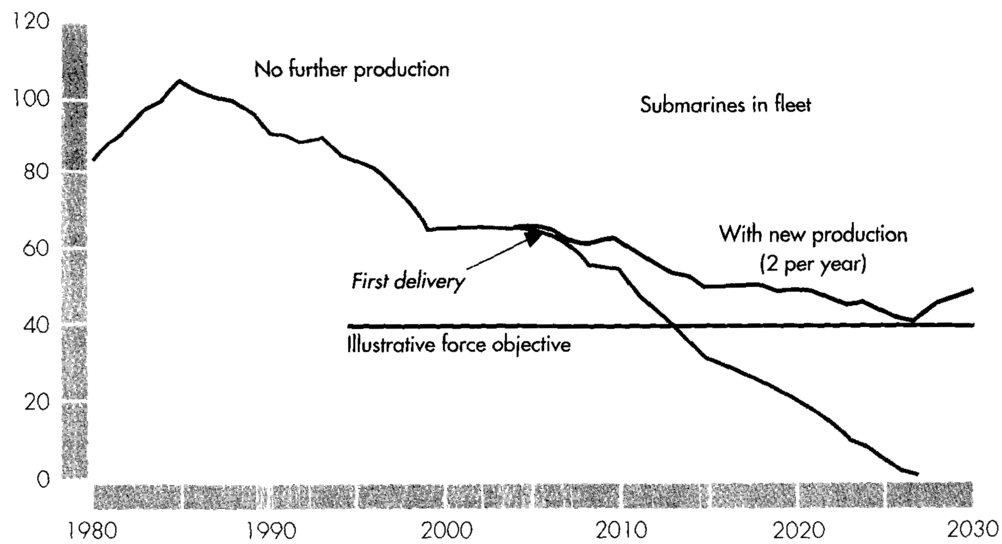


Figure 4—How Force Objective Determines Gap Length at a Given Production Rate

We can make several observations in connection with Figure 4:

- If delivery of new attack submarines gets under way in 2005 and continues at the rate of two per year, the inventory still falls off (blue curve) because submarines of the current Los Angeles class are retiring at the rate of about four per year (gray curve).
- Around 2027, the last of the current class of submarines will be decommissioned and the inventory will drop to a low mark of 41—just above the illustrative force objective.
- If delivery of the new attack submarine is postponed until after 2005—if the starting point of the blue curve is moved further down the gray one—it will not be possible to sustain a 40-ship fleet. If delivery is to be postponed further, the desired fleet size must be reduced. Conversely, if a larger fleet is desired, the gap in submarine deliveries must be shorter. (Or, in either case, production rate must be increased; see below.)
- As mentioned above, it takes at least six years to build an attack submarine. Thus, if a fleet size of 40 is to be sustained at a production rate of no more than two per year, *construction* of the new attack submarine must begin by 1999.

Production rate also limits fleet size.

Maximum gap, desired fleet size, and maximum sustained production rate are interrelated. The implications for gap length cannot be understood without understanding the constraints that production rate places on fleet size. Figure 5 illustrates these constraints. Here, we assume that construction of the new attack submarine begins in 1998—the earliest date practical (design is still under way). Because a later restart date would mean a lower sustainable force structure, the fleet sizes shown in Figure 5 are the maximums that each production rate can sustain. What we learn from this graph is that, given the rate at which submarines will be retired in the future,

- a production rate of *one* submarine per year following a 1998 restart cannot even sustain a fleet size of 30. The fleet size drops below 30 around 2023.
- two per year (as in Figure 4) will sustain 40 but not 50.
- it takes three per year (with two shipyards working) to sustain 60.

To complicate matters further, ship age at decommissioning is not necessarily a constant. If, for example, the service lives of the more recently built submarines could be extended from a maximum of 30 years to 35 years, the fleet size sustainable at a given production rate would increase. The reason is that in push-

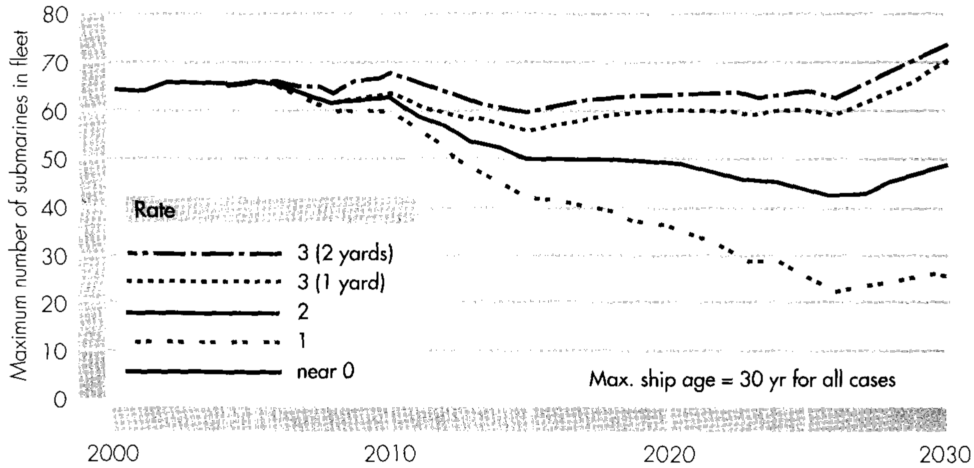


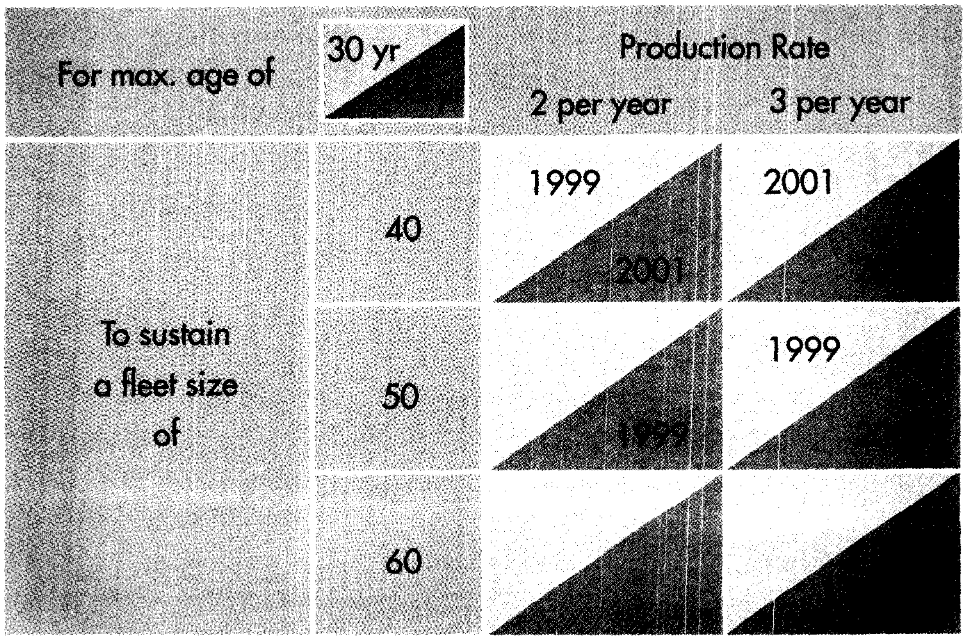
Figure 5—Influence of Production Rate on Fleet Size Sustainable

ing the decommissioning curve into the future, gains in inventory could be realized in the early delivery years following 2005, and the inventory curves would all rise. A fleet size of 50, for example, could then be sustained at two new submarines per year. However, *extending the lives of nuclear submarines is not a trivial task.* Much additional technical study and analysis of cost and military effectiveness is required before a decision could be made to implement such a plan. (As we will discuss in Chapter Three, ships can also be decommissioned early.)

Taking all these factors into account simultaneously, how long can the next submarine start be postponed?

A fleet size of 40 cannot be sustained if restart is postponed much beyond the end of the decade.

Figure 6 shows the latest year to start construction of the next submarine if various fleet sizes are to be maintained at a maximum production rate of two or three ships per year from a single shipyard, with a maximum ship life of 30 or 35 years. For several combinations of production rate, fleet size, and service life, it is not possible to sustain the fleet size minimum unless the first new attack submarine is started before 1998, which is unlikely. (These impractical combinations are represented by the blank triangles in Figure 6.)



NOTE: No third Seawolf; blank triangle indicates restart needed earlier than is feasible.

Figure 6—Latest Year to Restart Submarine Construction

The 1999 date in the upper left corner of Figure 6 represents the case shown in Figure 4—40 ships sustained at two per year. If ship life could be extended to 35 years, then ships come out of the fleet later and construction need not be started so soon; production can be postponed until 2001.

If it is decided that a bigger fleet is needed, then more of the ships being retired from the fleet must be replaced and construction must start sooner. For most cases involving 50 or 60 ships at two per year, construction start for the first new attack submarine falls into the impractical range.

Building ships at three per year affords more flexibility. It would then be possible to sustain the fleet in two of the three cases in which it would be impractical to do so at two per year. In two of the three other cases, later restarts would be possible. In no case, however, is it possible to wait beyond 2001. (We also investigated the use of two shipyards at three per year, and again it would be necessary, even in the less demanding cases, for construction to start by 2001.)

Note the difference between the top two dates in Figure 6 (for 40 ships with a 30-year service life). The production rate is increased by 50 percent; it would seem that, at three ships per year, a 40-ship fleet might be built in about 13 years instead of the 20 years it would take at two per year. Despite this seven-year difference, only a two-year relaxation of the restart date is possible. If service life is 35 years instead of 30 years, increasing the production rate from two to three per year permits no further postponement of restart. Why isn't a bigger gap attainable?

The longer restart is postponed, the longer it takes to deliver the first submarine.

For the cases marked 2001 in Figure 6, the first submarine is not actually needed until 2010. In the interval between the end of currently planned submarine production in 1998 (shown by the longest of the gray bars in Figure 7) and 2001, part of the submarine workforce disperses. Because that workforce has to be rebuilt, the production time for the next ship stretches out from six years (as shown by the near-future restarts represented by the light blue bars) to nine years (the dark blue bar). (We derive this difference in construction from a workforce reconstitution model that we will discuss in Chapter Three.) If restart is postponed beyond 2001, the first submarine will not be ready until after 2010, and the 40-ship force will not be sustained. (We use the 40-ship fleet as an example here and in subsequent analysis because it permits a long gap without requiring a possibly unaffordable production rate of three per year.)

The light blue bars in Figure 7 represent what we have been calling a "continuous production" strategy. In fact, however, skills and resources required at one stage of submarine construction are not always needed at another. This is not a problem when submarine starts occur within a year or so of each other. In that case, workers employed in, for example, the last phase of submarine construction can find another submarine in final phase to work on when they finish their current one. Such a situation—one with truly continuous production—is illustrated by the stacked gray bars in Figure 7.

But some loss of capability occurs whenever analogous stages of construction do not follow each other closely. It is thus more accurate to refer to the "continuous production" strategy represented by the light blue bars as a "minimum gap" strategy. Even with the earliest restart now feasible (1996), some loss of early-phase construction expertise can be anticipated. A production gap is already under way, and it will result in a delivery gap.

Because we care mainly about the timing of delivery, we measure the gaps in Figure 7 from delivery to delivery: four years for the minimum-gap strategy (followed by another three-year gap) and 12 years for the maximum gap in the case shown. In the next chapter we will compare costs for the various maximum-gap strategies whose restart dates are shown in Figure 6 with the minimum-gap strategy depicted by the light blue bars in Figure 7.

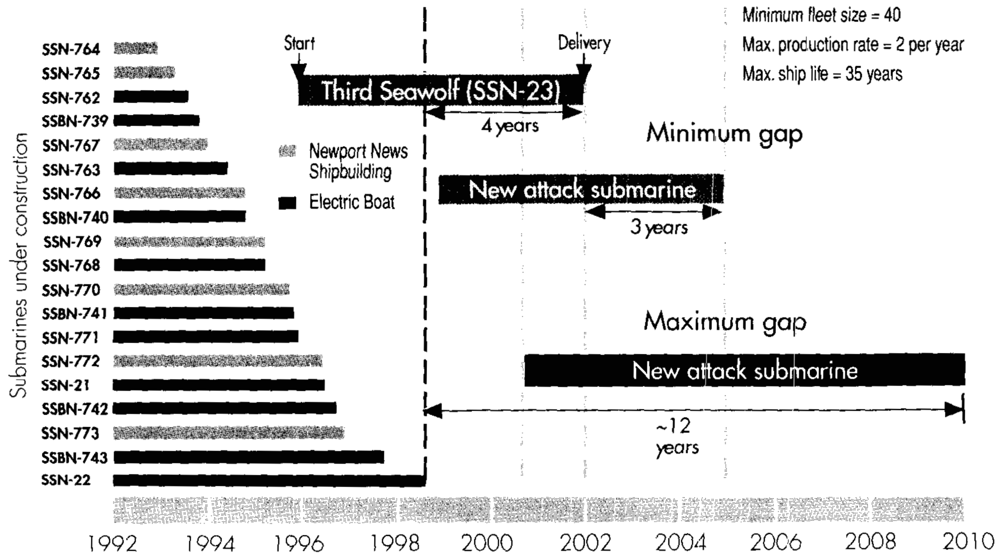


Figure 7—Relation Between Delivery Gap and Production Start

Chapter Three

HOW MUCH CAN BE SAVED BY POSTPONING PRODUCTION?

Extending the production gap both saves money and costs money.

It saves money for two reasons:

- First, submarine production is postponed, so that the cost of replacing the fleet is less when discounted to present-day dollars.
- Second, if production is deferred long enough, the next class of submarines will be designed and ready for construction. As ships of that class are likely to cost less than the current Seawolf class, which was designed for a Soviet-era threat, money can be saved by waiting.

Longer gaps run up extra shipyard costs of three kinds (see Figure 8):

- If submarine production is to be suspended for a period of years, substantial sums will have to be expended to shut down shipyard activities and facilities and do so in a manner that preserves tooling and information that might facilitate restart. Further expenses are incurred in association with releasing personnel.
- Then, the yard and its production lines will have to be maintained in working order during the gap. The yard still has to pay utilities, security and maintenance personnel, taxes, and so forth. And a cadre of skilled personnel will have to be retained if the yard is not to lose the know-how necessary to build submarines.
- Finally, additional expenses will be incurred when production is restarted. Some of that is for reconstituting facilities, but most of it is for rebuilding the workforce.

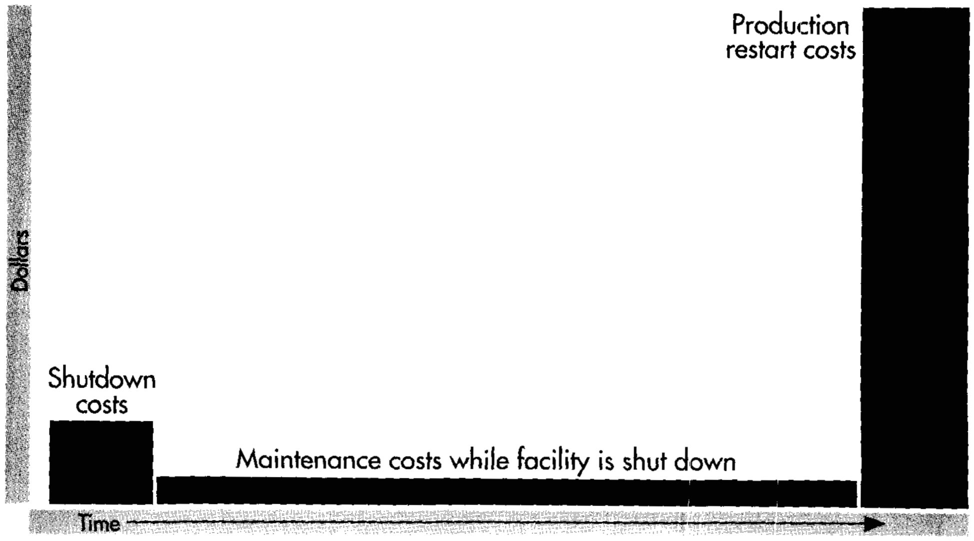


Figure 8—Course of Expenditures Associated with a Production Gap

To calculate workforce reconstitution costs, we built a model.

The shutdown and maintenance costs are straightforwardly calculated, but determining the cost and schedule effects of rebuilding the workforce required taking into account a number of variables. The model that does so is illustrated schematically in Figure 9.

The diagram shows the cadre mentioned above. We input a mentor:trainee ratio—how many new workers each cadre member could train—and also took account of how worker efficiency and pay increase (and attrition decreases) with experience. We also considered the cost to hire and train each new worker and the effect on overhead per ship when production is just starting. (Data used in the model were derived from public and private shipyard experience, including apprentice programs.) The model calculates how long it would take to build the first ships after restart and how long it would take to reach a steady-state production rate. The model also estimates how much more it would cost to build those pre-steady-state ships than it would have at steady state.

We found that the cost of restarting production at a shipyard could run well over a billion dollars. Much of that could be saved if workers could be retained through other shipyard activities (e.g., overhauls) during the submarine production hiatus.

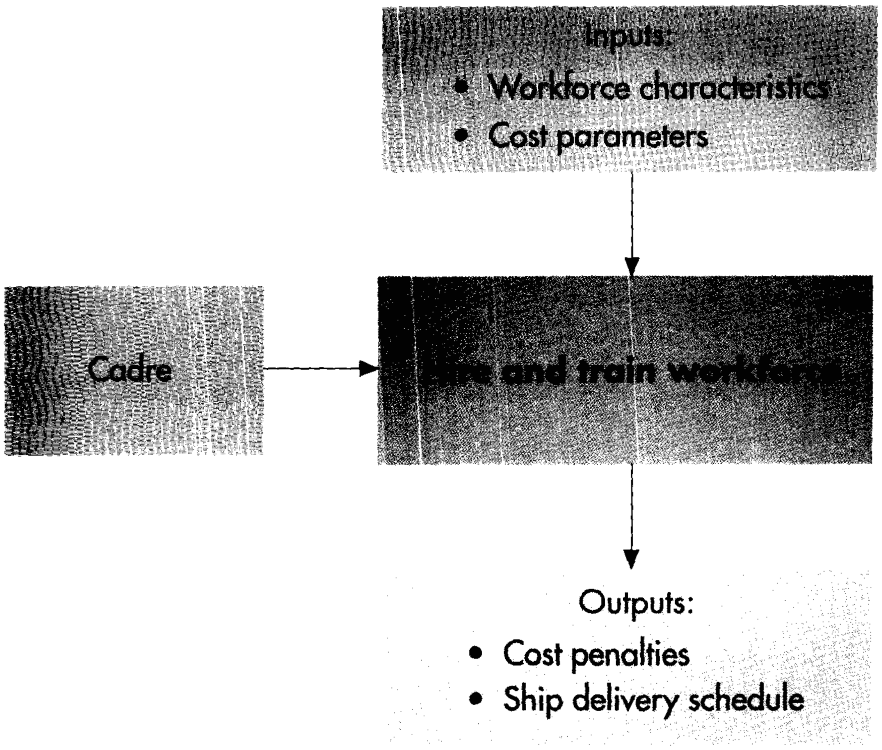


Figure 9—Workforce Reconstitution Model

Besides the extra costs to the shipyards, an extended gap means additional costs to reconstitute submarine component vendors.

Shipyards buy or receive through the government many submarine components—nuclear and nonnuclear—produced by outside suppliers. To be ready for installation at the correct point in submarine construction, work on some key *nuclear* components must begin well in advance (see Figure 10). Currently planned work should keep nuclear-system vendors busy for the next two or three years (assuming a scheduled new aircraft carrier is built). Design work has already begun on the longest-lead components (e.g., the reactor vessel and steam generator) for a new attack submarine. Unless there is a lengthy production gap, it would not be practical to shut down the suppliers of such components. Reconstituting them might require more lead time than the gap would make available and would result in hundreds of millions of dollars in extra costs. As for reactor cores, there is no point in shutting down the sole remain-

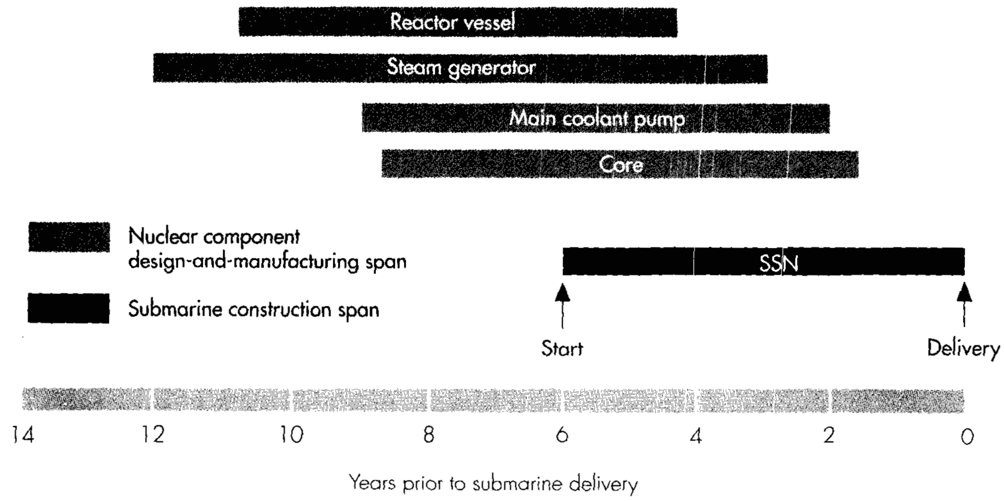


Figure 10—Shipyard Need Dates and Design-and-Manufacturing Spans, Selected Nuclear Components, First Ship of Seawolf Class

ing U.S. producer, as that firm is engaged in producing cores to refuel aircraft carriers and SSBNs.

The nuclear-vendor base is small, but there are on the order of a thousand suppliers of *nonnuclear* submarine-specific components. For the most part, supply of these components could be quickly resumed once demand for them is renewed following a production gap. A small fraction, however, require special skills or technologies that may be difficult to recover should the firms producing them go out of business during a gap. For these cases, comprising at least a few products and at most a few dozen, reconstitution costs could amount to half a billion dollars.

If submarine orders are delayed, the government could take a variety of actions that could help avoid the need to reconstitute the nuclear and nonunclear vendor bases. Such measures include funding the production of items in advance of need, paying the firms to develop and prototype advanced methods to manufacture the needed components, or allocating other Navy work to those firms. Each of these measures has its drawbacks. *But whatever is chosen, it must be done soon, as critical nonnuclear suppliers may otherwise begin to go out of business within the next year.*

Gap-related costs could approach $3 billion.

We combined shipyard shutdown and maintenance costs and shipyard and vendor restart costs for each of several scenarios at Newport News and Electric Boat. Figure 11 shows two such scenarios. Both represent a maximum-gap strategy with restart in 2001 and buildup to a maximum rate of two ships delivered per year. But the column on the left assumes no work in the shipyard between the end of current construction and 2001; the one on the right assumes sufficient submarine overhaul work is directed to the yard in the interim to sustain 1000 workers. Without further work, gap-related costs are on the order of $2.75 billion. With overhauls, that number drops to about $1.5 billion. (This does not take into account negative effects on the yard that had the overall work before it was redirected to the construction yard—or what to do with the overhaul work once construction resumes.)

The breakdown of these totals into categories is as shown in Figure 8 and described in the text accompanying that figure, except that we have added vendor restart costs. Some of the shipyard costs are for restarting facilities, but the bulk is personnel-related and reflects the reconstitution of the labor force, the speed of which is limited by the availability of skilled workers for rehire and men-

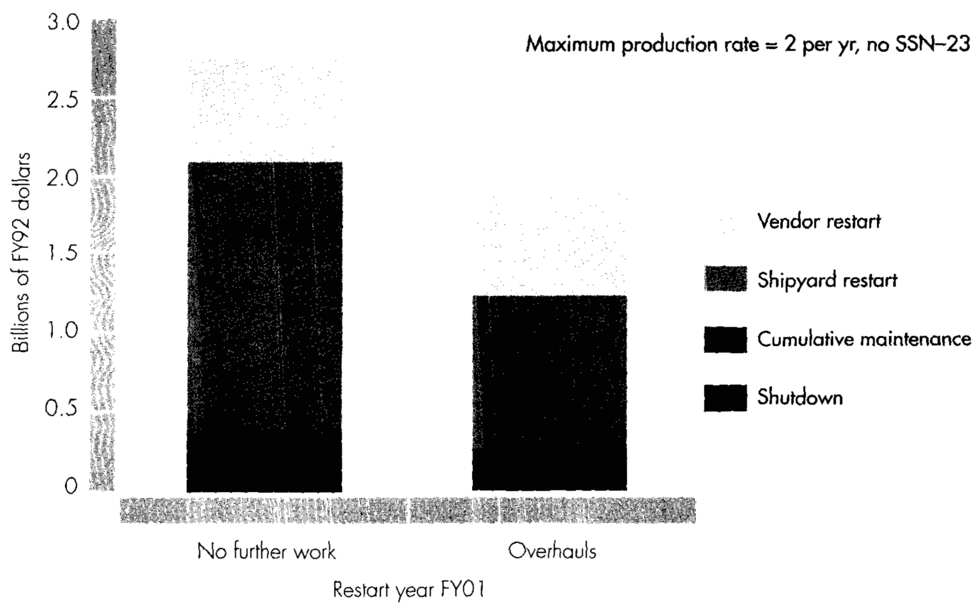


Figure 11—Illustrative Shutdown, Maintenance, and Restart Costs

tor:trainee ratios that must be maintained, among other things. The reconstitution-related cost penalty includes greater per-ship overhead charges that accrue when the initially small size of the labor force limits the number of ships in the yard. It also reflects inefficiencies from having a high proportion of trainees on the job, along with hiring and training costs. Vendor costs are predominantly for reconstituting nonnuclear vendors, which, as we mentioned above, are more likely than nuclear vendors to exit the business in the near future. Again, we consider only the production base; these costs do not include the costs of maintaining the R&D, technology, and design base over the course of the gap or reconstituting it afterwards.

To estimate non-gap-related costs, we built a second analytical model.

Figure 12 is a schematic representation of our fleet composition analysis model. The elements are as listed below.

- The variables we considered are shown in the gray boxes as inputs to the model. The first three boxes include the items discussed in Chapter Two. In addition, the Navy plans to decommission some ships early. To the extent this is done while there is an excess of ships in the fleet, it can save maintenance and operating costs without requiring earlier restart. We also incorporated data on current costs and fleet inventory.
- The model, shown here in dark blue, determines a schedule of construction and decommissioning over the next 36 years that minimizes the net present value (NPV) of the costs of production and operating and supporting (O&S) the fleet.
- Thus, the output, in the light blue boxes, is in the form of a delivery schedule, a resulting fleet-size profile, and a profile of costs over time.

Recall that we sought the maximum gap, not the cost-minimizing gap. That is why we estimated gap-related costs separately from the model. We then combined the costs directly associated with the gap (those in Figure 11) with the subsequent production, operation, and maintenance costs obtained through the model shown in Figure 12. The result was the total costs associated with minimum- and maximum-gap strategies for various combinations of fleet size, production rate, and ship life.

When all costs are taken into account, extending the production gap saves little, if anything.

Figure 13 is a cumulative depiction of discounted costs over time to maintain a fleet of 40 ships with the standard 30-year service life at a maximum production

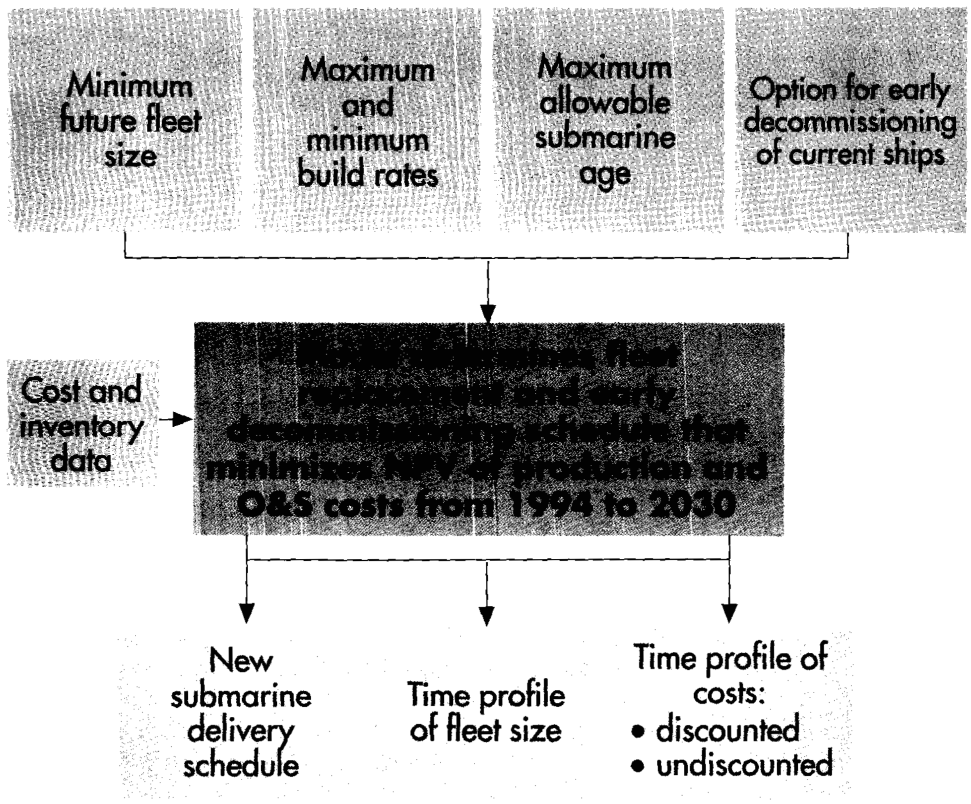


Figure 12—Fleet Composition Analysis Model

rate of two ships per year. Relative to the total, there is not much difference between the minimum- and maximum-gap strategy over the long run. In fact, considering the uncertainties involved in projecting costs over such a long period, we cannot say with confidence that there is *any* difference at all.

Savings *are* realized over the short term, or by extending ship life.

The profile of savings over the course of time is shown more clearly in Figure 14, where the cost of the minimum-gap strategy for a 30-year ship life is depicted as a baseline and the savings of other strategies are shown relative to it. Note the following comparisons:

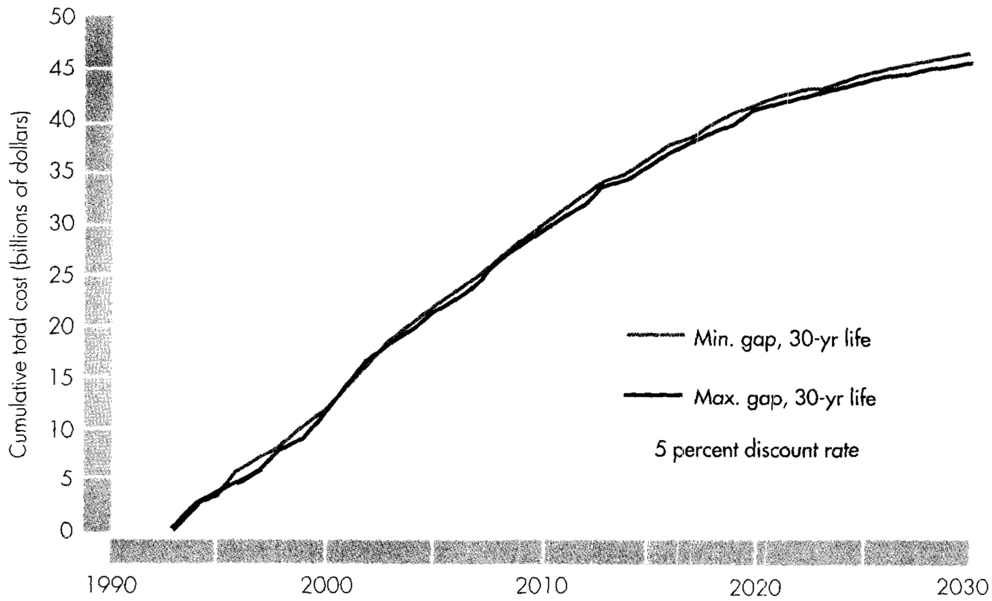


Figure 13—Cumulative Total Cost of Minimum- and Maximum-Gap Strategies to Sustain a 40-Ship Fleet at Two Ships Delivered per Year

- Over most of the time frame we looked at and assuming a ship life of 30 years, the maximum gap has a cumulative cost advantage of a half a billion dollars or so—again, less than our estimating error.
- If ship life can be extended to 35 years, maximizing the production gap saves even less (compare the lower pair of curves to each other).
- However, for both comparisons, *there are larger differences over the short term,* and these might be meaningful to some decisionmakers. (Note that in the 35-year case this "short-term" advantage lasts much longer. It may also be of interest that the short-term savings in the 30-year case arise largely from not proceeding with the third Seawolf-class submarine.)
- Much larger savings are realized from extending ship life than from extending the production gap. (But again, extending ship life entails important costs we do not consider here.)

We made comparisons like this for larger fleet sizes and for three ships produced per year and, while the short-term results varied somewhat, the lesson for the long term was the same: little or no cost advantage for delaying

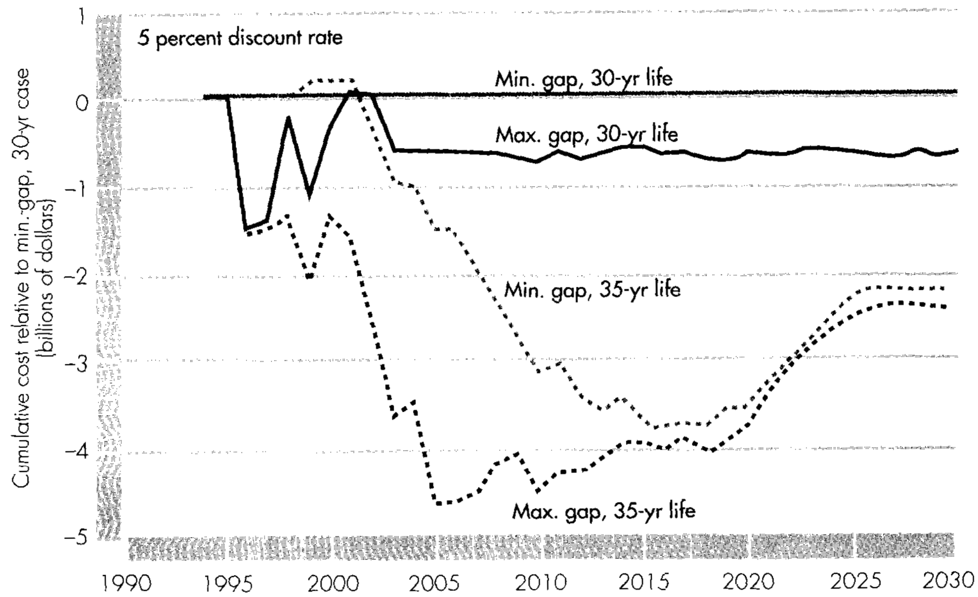


Figure 14—Difference in Cumulative Costs Between Each Strategy and the Minimum-Gap, 30-Year-Ship-Life Strategy

production of the next submarine. For example, when a production rate of three ships per year is allowed,

- the long-term difference between minimum- and maximum-gap strategies is less than a billion dollars (not necessarily in favor of the maximum gap);
- life extension, on the other hand, results in savings ranging from about a billion to about two and a half billion dollars, depending on the case.

The outcome of these analyses can be summarized as follows: when taking the long view, cost is *not* a good criterion for deciding between production strategies.

Chapter Four

WHAT ARE THE RISKS?

The modest savings from extending the production and delivery gaps are achieved at a substantial increase in program risk. Sources of risk can be grouped into three classes.

Lack of analogues may have led us to underestimate costs and delays.

Some risk arises from the inherent uncertainty in making any kind of cost or schedule estimate for an action that has no real analogue. No dormant industries have experienced production restarts recently. Also, we have made no allowance for problem resolution in our estimates, although British experience indicates that it would be challenging to produce submarines that integrate new technologies developed during the gap years—and the British were resuscitating diesel technology. The challenges—and the associated extra costs and delays—could only be greater for nuclear submarines.

We do know of potential infrastructure failures that we have been unable to assess quantitatively.

Such failures could substantially postpone or even jeopardize a restart program's successful completion. They include the following:

- For some of the longer gap scenarios, submarine design and development skills may atrophy, further lengthening the production phase. Talented engineers faced with unproductive work during a gap may look for opportunities elsewhere. Potential recruits may see the shutdown and decide to pursue other career opportunities. How much could it cost to attract people back to submarine design who have committed elsewhere? We don't know.

- It is uncertain whether construction skills can be reconstituted at any reasonable price; again, once firms and individuals leave the industry, it may not be possible to lure them back.
- Submarine construction requires specialized management and oversight skills, both at the shipyards and vendors and in the government. Persons with these skills might move on to other opportunities during an extended gap.
- Nuclear licenses and environmental permits may be lost if production is suspended.
- If restarting production at a lower skill level results in an eventual accident, particularly one involving a nuclear reactor, the ship's crew and everyone else in the vicinity could be endangered, and public pressure could halt submarine construction and curtail operations indefinitely.

Other risks include failure to meet national security objectives and the possibility of future production gaps.

Extending the production gap constrains the fleet sizes and production rates that can be chosen. World events may lead to a decision that a fleet size of 60 is needed to ensure national security. Such a fleet size cannot be sustained if construction on the next submarine is not initiated before 2000. Even for a 50-ship fleet, delaying the next submarine start to 2000 or beyond would require a production rate greater than two per year. It is uncertain whether submarine production of three per year would be viewed as affordable, and such a program would produce a full fleet of 30-year-life submarines in less than 20 years, resulting in another production gap in the 2030s.

Chapter Five

CONCLUSIONS AND RECOMMENDATIONS

It is impractical to postpone submarine production much beyond the year 2000.

- Production schedule options are limited. Construction of the first submarine of the next class probably cannot be started before 1998. (Current plans call for a third submarine of the Seawolf class to be started in 1996.) But construction of the new attack submarine *must* start by about 2001 if a fleet close in size to the one now planned is to be sustained at reasonable production rates. The difference between the shortest gap now feasible (to 1998) and the longest practical (to 2001) is thus only three years (without the third Seawolf; with the third Seawolf, it is five years—1996 to 2001).
- The longer the gap, the more difficult it will be to sustain a fleet large enough to meet the nation's projected needs. If the next submarine is not started until after 1999 and ships are still retired at the age of 30, it will not be possible to sustain a fleet size of 50; a production rate of three per year would be required to keep the fleet from falling below 40 ships.
- If the more recently built Los Angeles–class submarines could be operated beyond the normal decommissioning age of 30 years, greater flexibility in production scheduling could be realized. It would be possible to sustain a greater fleet size at the same production rate or the same fleet size at a lower production rate than would be the case with the current decommissioning age.

It is not clear that an extended production gap would result in any savings over the long term.

- For some combinations of desired fleet size and maximum production rate, savings may be realized by extending the gap; for others, losses may result. In all cases, the projected gains or losses are smaller than the errors that accompany our prediction methods over that time frame, so they cannot be asserted with any confidence. However, it appears that, for some combinations of fleet size and production rate, substantial gains (on the order of a few billion dollars) will accrue over the next 10 years if the gap is extended.

- Larger long-run savings may be realized by extending ship life beyond 30 years. However, we do not in this analysis account for any costs of determining the feasibility of ship life extension or any costs necessary to effect such extensions beyond those of a standard overhaul.

These marginal savings are realized at substantial risk.

- In extending the production gap, the Department of Defense would run several risks that could add to the delays and costs we have been able to estimate. The industrial base may lose the expertise of individuals and the capabilities of firms that are essential for efficient reconstitution following a gap. It may be very difficult for those design and production workers who do remain to integrate all the technologies becoming available in the interim into high-performance submarines. And environmental and nuclear regulatory impediments could add years to the time required to reconstitute.
- There can be little tolerance for trial and error in nuclear-submarine design and construction. Losses of cumulative individual and institutional expertise could raise the risk of system malfunction and of an accident, possibly a nuclear one. Obviously, a nuclear accident would have grave consequences.

We recommend that DoD act to minimize the submarine production gap that is now under way.

- Considering that the savings from extending the current production gap are uncertain and that the risks of doing so are great, we recommend that construction on the next submarines begin as soon as practicable.
- Specifically, we recommend, first, that the third Seawolf-class submarine (SSN-23) be started around 1996 and that the first new attack submarine be started as soon as feasible, around 1998.
- Finally, considering that savings may be realized by extending the life span of many of the current class of submarines, we recommend that the Navy carefully evaluate this option.

Our recommendations are based on our own judgment regarding prudent weights to be attached to the results of our quantitative cost and schedule analysis and our qualitative risk assessment. Others using the same methodology would arrive at a different course of action if they took either (or both) of two alternative viewpoints.

- First, in reaching a restart decision, they might have a high tolerance for risk. This would be more defensible over the short run (e.g., in deciding not to proceed with SSN-23) than over the long run.
- Second, they might attach much greater weight to the short-term savings of the maximum-gap strategies. The latter approach might be taken by someone who had little or no confidence in cost projections running 20 or 30 years into the future or who for other reasons heavily discounted future costs.

MR-456/1-OSD

Document Separator

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
2531 JEFFERSON DAVIS HIGHWAY
ARLINGTON VA 22242-5160

IN REPLY REFER TO
5310
Ser 07F/122

BUSINESS SENSITIVE

14 OCT 1994

From: Commander, Naval Sea Systems Command

Subj: FY 95 STABILIZED MANDAY RATES AT NAVAL SHIPYARDS

Ref: (a) NAVCOMPT ltr of 29 Sep 94

Encl: (1) Program Hull Rates for Repairs and Alterations at Naval Shipyards
(2) Stabilized Manday Rates for Other Than Program Hulls
(3) FY 95 Basic Program and RA/TA Rates at Naval Shipyards

1. Enclosure (1) provides final Stabilized manday rates for the FY 95 Fleet Maintenance and Modernization Programs. The alteration rates apply to all alterations including nuclear and ordnance. Enclosure (2) provides stabilized manday rates for "Other Than Program Hull Work." Enclosure (3) provides basic program rates for the FY 95 program. These rates support the FY 95 President's Budget Submission and were approved by NAVCOMPT by reference (a).

3. All Naval Shipyards are to ensure that the enclosed rates are applied. Specific authority to establish additional rates must be authorized by NAVSEA. Requests for new rates are to be submitted to SEA 07F1A for review prior to NAVSEA approval.

M. C. HAMMES
By direction

Distribution:
FKP7 (Code 100, 600)
NAVCOMPT (NCB-15)
N863
N43
N21
CINCLANTFLT
CINCPACFLT
SPAWAR (Encl (3))
SPCC MECHANICSBURG PA (Encl (2) only)
NAVSSES (0061C)
NAVSEA Special distribution list

BUSINESS SENSITIVE

FY1995 STABILIZED MANDAY RATES FOR OTHER THAN PROGRAM HULLS

NORFOLK NSY

TYPE OR WORK	Labor/ Overhead	AOR & JLSC Surcharges	Approved Rates
OTHER SHIPWORK			
TIGER TEAM	424.03	148.05	572.08
TIGER TEAM - AIT	396.83	148.05	544.88
SHIP W/O AVAIL	422.43	148.05	570.48
SHIP AVAIL Q. A. ANAL	747.23	148.05	895.28
R,T,D & E	428.35	148.05	576.40
DSA-DESIGN SERVICES	402.03	148.05	550.08
MISC. OTHER SHIPWORK	382.75	148.05	530.80
MFG FOR OTHER THAN DMI	381.55	148.05	529.60
SPECIAL PURP DESIGN SERV	454.67	148.05	602.72
REFIT/RESTORATION			
SHAFTS	480.91	148.05	628.96
PUMPS	400.43	148.05	548.48
DIESEL ENGINES	446.51	148.05	594.56
ELECTRONIC & ELEC	386.67	148.05	534.72
REPAIRABLE REWORK CENTER	376.51	148.05	524.56
SMALL CRAFT REHAB & RESTR	466.51	148.05	614.56
RADIAC	453.63	148.05	601.68
CRYPTO WORK	466.99	148.05	615.04
OTHER PRODUCTIVE WORK			
S[illegible]L PURPOSE NUCLEAR	530.03	148.05	678.08
OTHER PRODUCTS & SERVICES	500.99	148.05	649.04
CANNIBILIZATION	437.39	148.05	585.44
QUALITY ASSURANCE/CALIB/TESTING	872.59	148.05	1,020.64
CRANE CENTER	337.71	148.05	485.76
PESO	382.75	148.05	530.80
MILITARY SUPPORT SERVICES	295.31	148.05	443.36
SERVICE CRAFT	498.19	148.05	646.24
FIREFIGHTERS	245.79	148.05	393.84
PUB WKS RECURR MAINT & REP	452.99	148.05	601.04
SUPPORT OF TENANTS & SAT	354.27	148.05	502.32
MULTIPLE SHIP PLANNING TEAM	226.11	148.05	374.16
IMANPY	334.03	148.05	482.08
NSEPY	293.39	148.05	441.44
MIXED MATERIAL	385.07	148.05	533.12
RA/TA	466.83	148.05	614.88

Enclosure (2)

FY 1995 STABILIZED MANDAY RATES FOR OTHER THAN PROGRAM HULLS

CHARLESTON NSY

TYPE OF WORK	Labor/ Overhead	AOR & JLSC Surcharges	Approved Rate
SCN	292.22	78.74	370.96
OTHER SHIPWORK			
TIGER TEAM	243.98	78.74	322.72
MISC. OTHER SHIPWORK	227.10	78.74	305.84
SGC/SGI	340.62	78.74	419.36
REFIT/RESTORATION			
CALIBRATION-X67	237.42	78.74	316.16
CALIBRATION-C/137	246.22	78.74	324.96
REFIT-PROPS & GAGES	241.18	78.74	319.92
REFIT-SHAFTS	254.14	78.74	332.88
REFIT-PUMPS	247.66	78.74	326.40
REFIT-MISC	272.38	78.74	351.12
REFIT-NUCLEAR SX	245.10	78.74	323.84
OTHER PRODUCTIVE WORK			
NON-SHIPWORK MFG OTHER THAN SHOP 06	207.02	78.74	285.76
DESIGN SERVICES ALLOCATION	257.18	78.74	335.92
OFFICE EQUIP. REPAIR/MFG BY SHOP 06	226.78	78.74	305.52
WORK CENTER 49	218.06	78.74	296.80
LEGAL OFFICE	238.14	78.74	316.88
MOORED TRAINING SHIP SUPPORT	390.46	78.74	469.20
MISCELLANEOUS NONSHIPWORK	372.54	78.74	451.28
TRAINING CENTERS	287.90	78.74	366.64
DISPOSAL OF FLEET HAZARDOUS WASTE	239.10	78.74	317.84
SUBSAFE CERTIFICATION	312.38	78.74	391.12
ADDITIONS AND IMPROVEMENTS TO PLANT	219.58	78.74	298.32
INTER-ACTIVITY SUPPORT (NON PWLA)	221.10	78.74	299.84
INTER-ACTIVITY SUPPORT (PWLA)	239.82	78.74	318.56
SUPPORT OF TENANTS AND SATELLITES	290.46	78.74	369.20
FAMILY HOUSING	216.30	78.74	295.04
FLEET AND FAMILY SUPPORT	207.26	78.74	286.00
RA/TA	326.86	78.74	405.60

Enclosure (2)

FY 1995 STABILIZED MANDAY RATES FOR OTHER THAN PROGRAM HULLS

PORTSMOUTH NSY

TYPE OF WORK	Labor/ Overhead	AOR & JLSC Surcharges	Approved Rate
OTHER SHIPWORK			
DSA DESIGN SERVICES	382.65	145.83	528.48
REFIT/RESTORATION			
PROPELLERS	525.37	145.83	671.20
SHAFTS	545.13	145.83	690.96
PUMPS (w/QFM)	485.37	145.83	631.20
RADAR ANTENNA RESTORATION	471.37	145.83	617.20
SONAR 2F COG MATERIAL	419.77	145.83	565.60
SONAR ALL OTHER	417.45	145.83	563.28
SPEC PURPOSE REFIT/RESTORATION	437.53	145.83	583.36
OTHER PRODUCTIVE WORK			
PUBLIC WORKS	304.65	145.83	450.48
FAMILY HOUSING	288.97	145.83	434.80
OTHER PRODUCTS &SERVICES	468.01	145.83	613.84
ADMINISTRATIVE SERVICES	290.49	145.83	436.32
SERVICE CRAFT MAINTENANCE	355.77	145.83	501.60
COMPTROLLER SERVICES	280.49	145.83	426.32
SUPPORT SERVICE WIDE SUPPLY	240.01	145.83	385.84
TYPE I SUPPLY	294.25	145.83	440.08
LEVEL I INSPECTION	349.21	145.83	495.04
MSSD	413.93	145.83	559.76
CALIBRATION SERVICES	335.13	145.83	480.96
CALIBRATION/RPR OF RADIAC	453.61	145.83	599.44
REINSPEC OF NUC MAT'L (SPCC)	395.29	145.83	541.12
ASWOC MODULE	456.89	145.83	602.72
WORKLOAD LEVELING SHOP	276.09	145.83	421.92
GEAR BOXES	445.29	145.83	591.12
ROTORS	428.73	145.83	574.56
RA/TA			
TIGER TEAM	539.85	145.83	685.68
DEEP SUBMERGENCE VECHICLE	458.89	145.83	604.72
SURFACE CRAFT TIGER TEAM	375.45	145.83	521.28
OFF-SITE SUBMARINE RA/TA	472.17	145.83	618.00
OFF-SITE SURFACE CRAFT RA/TA	307.77	145.83	453.60
NON-EMERGENT SUBMARINE TIGER TEAM	455.93	145.83	601.76
NON-EMERGENT SURFACE CRAFT TIGER TEAM	291.53	145.83	437.36

FY 1995 STABILIZED MANDAY RATES FOR OTHER THAN PROGRAM HULLS

PHILADELPHIA NSY

TYPE OF WORK	Labor/ Overhead	AOR & JLSC Surcharges	Approved Rates
OTHER SHIPWORK			
R&D TASK	365.56	82.60	448.16
DSA DESIGN SERVICES	358.76	82.60	441.36
ADVANCE PLANNING	379.56	82.60	462.16
TIGER TEAM	357.64	82.60	440.24
PROPELLER CASTS NI AL BR	358.20	82.60	440.80
CASTING CU IN	357.80	82.60	440.40
WINCH PROGRAM	361.32	82.60	443.92
DESIGN DAMAGE CONTROL	357.56	82.60	440.16
REFIT/RESTORATION			
PROPELLERS & GAGES	403.08	82.60	485.68
REPAIR MTL IN STORE	396.68	82.60	479.28
NAVTAC DATA	391.72	82.60	474.32
SONAR	391.72	82.60	474.32
RADAR ANTENNA RESTORE	393.16	82.60	475.76
CALIBRATION (CRYPTO)	406.28	82.60	488.88
OTHER PRODUCTIVE WORK			
ADDS/IMPROVE TO PLANT	352.04	82.60	434.64
SUPPORT OF TENANTS	242.28	82.60	324.88
INDUSTRIAL TEST LAB	386.84	82.60	469.44
NON-NUCLEAR INSP	387.48	82.60	470.08
NON-DEST TEST DIV	387.16	82.60	469.76
OTHER PRODS & SERVICES	362.52	82.60	445.12
NON-INDUST PROD WORK	319.72	82.60	402.32
ELECTRONIC TEST EQUIP	383.56	82.60	466.16
POLICE SECURITY	254.76	82.60	337.36
SERVICE CRAFT MAINT	357.08	82.60	439.68
BERTHING SERVICES	356.76	82.60	439.36
SHIP FORCES MTL	272.68	82.60	355.28
INACTIVE PATTERNS	350.20	82.60	432.80
PW MAINT RECURR/NON-RECURR	283.40	82.60	366.00
DDRA SUPPLY SERVICES	225.24	82.60	307.84
PROD SHOP SERVICES SUPPLY	354.68	82.60	437.28
NSC DETACHMENT-SUPPLY	240.68	82.60	323.28
NAVSHIPSO	312.36	82.60	394.96
PW TRANSPORTATION	279.72	82.60	362.32
PW GENERAL ENGINEERING	277.40	82.60	360.00
RA/TA	438.52	82.60	521.12

FY 1995 STABILIZED MANDAY RATES FOR OTHER THAN PROGRAM HULLS

LONG BEACH NSY

TYPE OF WORK	Labor/ Overhead	AOR & JLSC Surcharges	Approved Rate
SCN			
SCN FUNDED WORK	483.08	61.96	545.04
OTHER SHIPWORK			
DESIGN-FFG-EPY	390.60	61.96	452.56
FOR SHIPYARD AVAIL/PERA FUNDED (POT&I/SARP)	507.96	61.96	569.92
DESIGN	541.96	61.96	603.92
REFIT/RESTORATION			
DEGAUSSING & MINE	463.00	61.96	524.96
SCANNER EQUIP NAVSEA	467.96	61.96	529.92
PROPELLERS & GAUGES & SHAFTS	465.80	61.96	527.76
4TH GEN SHT-HAULING	465.40	61.96	527.36
ENGINES (NAVSEA)	479.24	61.96	541.20
DIESEL ENGINE 2S (NAVY)	494.04	61.96	556.00
ALCO TURBOCHARGES	500.12	61.96	562.08
WINCHES, HOISTS & CRANES	486.04	61.96	548.00
POWER & HYD PUMP	498.44	61.96	560.40
PUMP UNIT	468.52	61.96	530.48
VALVES, POWERED (SPCC)	491.16	61.96	553.12
RADIO, TV, COMM, INTERCOM & PA	467.72	61.96	529.68
RADAR EQUIPMENT (SPCC)	459.24	61.96	521.20
RADAR EQUIPMENT (NAVSEA)	457.16	61.96	519.12
RADAR SWITCHBOARD	470.12	61.96	532.08
UNDERWATER SOUND EQUIP	475.64	61.96	537.60
MISC COMM EQUIP	459.72	61.96	521.68
ANTENNAS WAVEGUIDES	459.56	61.96	521.52
(SPCC) (NAVSEA)	469.96	61.96	531.92
MISC. ELECT. COMP.	456.68	61.96	518.64
MOTORS, ELECTRICAL	469.64	61.96	531.60
ELECT. CONTROL EQUIP & GENERATORS	467.56	61.96	529.52
CONNECTORS, ELECT	464.20	61.96	526.16
RECTIFYING EQUIPMENT	465.96	61.96	527.92
SHIPBOARD ALARM & SIGNAL SYSTEM	474.44	61.96	536.40
NAVIGATIONAL EQUIP	467.72	61.96	529.68
ELECTRO & ELECTRONICS	499.00	61.96	560.96
PRESSURE, TEMPERATURE (SPCC)	501.88	61.96	563.84
CIRCUIT CARD	462.84	61.96	524.80
MISCELLANEOUS	473.32	61.96	535.28

FY 1995 STABILIZED MANDAY RATES FOR OTHER THAN PROGRAM HULLS

LONG BEACH NSY

OTHER PRODUCTIVE WORK

CALIB. OF ELECTRONIC TEST EQUIP	501.40	61.96	563.36
CALIB./REPAIR OF STANDARDS	554.92	61.96	616.88
FAMILY HOUSING	433.48	61.96	495.44
RDT&EN-SHIP SUPPORT	467.96	61.96	529.92
OTHER PRODUCTS & SERVICES	489.32	61.96	551.28
PUBLIC WORK SERVICES	438.76	61.96	500.72
MILITARY SUPPORT PRODUCTION	399.16	61.96	461.12
MILITARY SUPPORT PUBLIC WORKS	361.08	61.96	423.04
MILITARY SUPPORT G & A	366.76	61.96	428.72

RA/TA

RA/TA	523.64	61.96	585.60
OTHER DEFENSE /GOV'T DEPTS	565.24	61.96	627.20
ORDNANCE ALTERATIONS	567.08	61.96	629.04
ORDNANCE-RSSI/AMMO	564.52	61.96	626.48
TIGER TEAM EFFORT	564.52	61.96	626.48
SHIPWORK RDT&EN	563.24	61.96	625.20
SHIPS WITHOUT AVAILABILITIES-ALTS	566.12	61.96	628.08
SHIPS WITHOUT AVAILABILITES-REPAIRS	564.28	61.96	626.24

FY 1995 STABILIZED MANDAY RATES FOR OTHER THAN PROGRAM HULLS

PEARL HARBOR NSY

TYPE OF WORK	Labor/ Overhead	AOR & JLSC Surcharges	Approved Rate
SCN	607.48	179.64	787.12
OTHER SHIPWORK			
MULTIPLE SHIP PLANNING TEAM	459.40	179.64	639.04
TIGER TEAM	541.64	179.64	721.28
SHIP W/O AVAILABILITY	608.04	179.64	787.68
DIRECT DESIGN WORK	526.20	179.64	705.84
R&D TASKS (LESS SHIP AVAIL)	530.76	179.64	710.40
MISC. OTHER SHIPWORK	555.56	179.64	735.20
DSA DESIGN SERVICES	451.40	179.64	631.04
REFIT/RESTORATION			
PROPELLERS & GAGES	564.36	179.64	744.00
SHAFTS	560.60	179.64	740.24
MISCELLANEOUS	558.44	179.64	738.08
REPAIR TO MATERIAL IN STORE	573.88	179.64	753.52
OTHER PRODUCTIVE WORK			
CALIB-REPAIR	600.12	179.64	779.76
CALIB-REPAIR/RADIAC/STDS/TE	351.72	179.64	531.36
ELECTRONIC - X66	255.24	179.64	434.88
SPECIAL PURPOSE R&R	440.44	179.64	620.08
R&D (Non-Shipwork)	586.92	179.64	766.56
ADDITIONS/IMPROVEMENTS TO PLANT	506.52	179.64	686.16
OTHER PRODUCTS & SERVICES	610.36	179.64	790.00
IRSO (DPO)	233.24	179.64	412.88
INSTRUCTIONAL DESIGN CENTER	222.76	179.64	402.40
WORKLOAD LEVELING WC - X55	431.64	179.64	611.28
QA-OIL ANALYSIS	472.04	179.64	651.68
MINOR WORK/SERVICES	330.92	179.64	510.56
SUPPORT OF TENANTS & SATELLITES	515.16	179.64	694.80
DESIGN ENGINEERING SERVICES	371.48	179.64	551.12
ADMINISTRATIVE SERVICES	325.88	179.64	505.52
COMBAT ENGINEERING SERVICES	513.48	179.64	693.12
NUCLEAR ENGINEERING SERVICES	949.00	179.64	1,128.64
QA LABORATORY SERVICES	539.80	179.64	719.44
FEDERAL EXECUTIVE BOARD	270.76	179.64	450.40
OTHER	380.68	179.64	560.32
RA/TA	626.76	179.64	806.40

Enclosure (2)

FY 1995 STABILIZED MANDAY RATES FOR OTHER THAN PROGRAM HULLS

PUGET SOUND NSY

TYPE OF WORK	Labor/ Overhead	AOR & JLSC Surcharges	Approved Rate
SCN			
SCN FUNDED SHIPWORK	417.22	153.58	570.80
OTHER SHIPWORK			
OTHER REFIT/REST (SPECIFIC SHIP)	461.14	153.58	614.72
OTHER REFIT/REST (OTHER)	438.90	153.58	592.48
AERONAUTICS (CATAPULTES)	393.94	153.58	547.52
AERONAUTICS (ARRESTING GEAR)	391.70	153.58	545.28
R&D SHIPWORK	410.90	153.58	564.48
DSA DESIGN	294.10	153.58	447.68
BOSTON PLANNING YARD	268.50	153.58	422.08
OCEAN ENGINEERS	548.74	153.58	702.32
1212 SPECIAL (OTHER)	391.78	153.58	545.36
REFIT/RESTORATION			
OR&R-DESIGN	411.06	153.58	564.64
OR&R-TDD TASKS	477.46	153.58	631.04
OR&R-SMARSE DIRECT	291.46	153.58	445.04
OR&R-SMARSE INDIRECT	408.58	153.58	562.16
OR&R-STEAM GEN CLEAN	571.22	153.58	724.80
OVHL/RESTOR-RADIAC	363.38	153.58	516.96
CAL OF ELECT TEST	374.26	153.58	527.84
CAL/RPR RADIAC	392.42	153.58	546.00
ACT COORD RADIAC	438.66	153.58	592.24
SPECIAL CANNIBILIZATION	362.34	153.58	515.92
OVHL, RPR, RENOVATE	381.38	153.58	534.96
MAINT. INACTIVE SUBS	271.22	153.58	424.80
MISC OTHER SHIPWORK (O&M,N)	273.06	153.58	426.64
CONSTRT/CONVERSION	282.18	153.58	435.76
ALT/MODIFICATION	345.78	153.58	499.36
MISC OTHER SHIPWORK (OPN)	333.06	153.58	486.64
RPR MATL IN STORE	381.62	153.58	535.20
RPR MATL (CANNIBAL)	383.46	153.58	537.04
SPEC PURPOSE REFIT/REST	392.74	153.58	546.32
OTHER PRODUCTIVE WORK			
FAMILY HOUSING	196.58	153.58	350.16
RESEARCH/DEVELOP	283.14	153.58	436.72
OTHER PROD/SERVICES	293.94	153.58	447.52
MISC NON-SHIP WORK	278.90	153.58	432.48
ADD/IMPROVE TO PLANT	236.02	153.58	389.60

FY 1995 STABILIZED MANDAY RATES FOR OTHER THAN PROGAM HULLS

PUGET SOUND NSY

ADD/IMPROVE TO PLANT (NEW EQUIP)	252.82	153.58	406.40
ADD IMPROVE TO PROD	279.94	153.58	433.52
ADD IMPROVE TO PROD (NEW EQUIP)	209.86	153.58	363.44
PRODUCTIVE SERVICES	275.94	153.58	429.52
OTHER SERVICES	157.86	153.58	311.44
SERVICE CRAFT MAINT	248.66	153.58	402.24
PW SERVICES	213.22	153.58	366.80
PUBLIC WORKS (PRODUCTION)	252.58	153.58	406.16
PUBLIC WORKS (SHOP 02,03,07)	244.98	153.58	398.56
PUBLIC WORKS (P & E)	243.30	153.58	396.88
SUPPORT TENANTS	284.74	153.58	438.32
SUPPORT SATELLITIES	289.62	153.58	443.20

RA/TA

RA/TA NUCLEAR	422.58	153.58	576.16
RA /TA NON-NUCLEAR	383.30	153.58	536.88
TIGER TEAM (TYCOM)	404.74	153.58	558.32
TIGER TEAM (OTHER)	428.34	153.58	581.92
SEOC	374.10	153.58	527.68

Enclosure (2)

FY1995 STABILIZED MANDAY RATES FOR OTHER THAN PROGRAM HULLS

MARE ISLAND NSY

TYPE OR WORK	Labor/ Overhead	AOR & JLSC Surcharges	Approved Rate
REFIT/RESTORATION			
PROPELLERS/SHAFTS	624.10	92.22	716.32
ELECTRONICS/RADAR ANTENNA RESTOR	471.30	92.22	563.52
HM&E (REFIT & RESTORATION)	592.18	92.22	684.40
SPECIAL PURP REFIT/RESTORATION	579.22	92.22	671.44
OTHER PRODUCTIVE WORK			
CALIBRATION OF ELECTRONIC TEST EQUIP	547.54	92.22	639.76
CALIBRATION/RPR-RADIAC	550.82	92.22	643.04
R&D (NON-SHIPWORK)	432.82	92.22	525.04
ADDITIONS & IMPROVEMENTS TO PLANT	449.22	92.22	541.44
SUPPORT OF TENANTS & SATELLITES	454.74	92.22	546.96
OTHER PRODUCTS & SERVICES	441.06	92.22	533.28
PUBLIC WORKS (RECURR MAINT)	471.86	92.22	564.08
QUALITY OF LIFE	74.82	92.22	167.04
OTHER BASE SERVICES	234.82	92.22	327.04
IR/COMP	347.78	92.22	440.00
ASBESTOS SURVEY/ABATEMENT	347.78	92.22	440.00
ASBESTOS - OFF YARD	347.78	92.22	440.00

Enclosure (2)

FY 95 BASIC PROGRAM RATES

FY 1995	PTSMH	PHILA	NORVA	CHASN	LBECH	MARE	PUGET	PEARL
REPAIRS								
FY 1995	621.60	[illegible]63.68	608.32	398.56	585.60	664.16	562.24	739.60
FY 1996	632.64	472.08	619.36	405.92	598.16	678.00	571.68	752.56
FY 1997	645.28	481.84	631.84	414.40	612.32	693.60	582.40	767.36
ALTERATIONS								
FY 1995	617.28	463.68	624.48	382.72	570.16	675.20	573.44	803.28
FY 1996	628.32	472.08	635.92	389.76	582.32	689.36	583.12	817.84
FY 1997	640.8[illegible]	481.84	648 88	397.76	596.08	705.28	594.16	834.48
INACTIVATIONS								
FY 1995								
INAC/RCD/RCYC	617 76		690.16		589.04	652.96	520.72	868.60
RCD/MCD/RCYC							491.12	
RCYC							447.68	
FY 1996								
INAC/RCD/RCYC			703.04			666.56	529.12	884.96
RCD/MCD/RCYC							498.80	
RCYC							454.32	
FY 1997								
INAC/RCD/RC[illegible]			717.68			681.84	538.80	903.28
RCD/MCD/RC[illegible]							507.60	
RCYC							462.00	
OFF-SITE								
[illegible]Y 1995								
REPAIRS	5[illegible] 08		546.72		544.24			
ALTS	52[illegible]8		546.72		544.24			
FY 1996								
REPAIRS	528.56							
ALTS	528.56							
FY 1997								
REPAIRS	538.40							
ALTS	538.40							
RA/TA								
FY 1995	626.16	521.12	614.88	405.60	602.48	663.60	558.08	836.48

Enclosure (3)

Document Separator

NOT FOR PUBLICATION
UNTIL RELEASED BY
SENATE ARMED SERVICES COMMITTEE
SEA POWER SUBCOMMITTEE

James E. Turner, Jr.
Corporate Executive Vice President
General Dynamics Corporation

President
Electric Boat Division

Testimony before the U.S. Senate Armed Services Committee Sea Power Subcommittee

Washington, D.C.
May 16, 1995

NOT FOR PUBLICATION
UNTIL RELEASED BY
SENATE ARMED SERVICES COMMITTEE
SEA POWER SUBCOMMITTEE

TABLE OF CONTENTS

I. INTRODUCTION

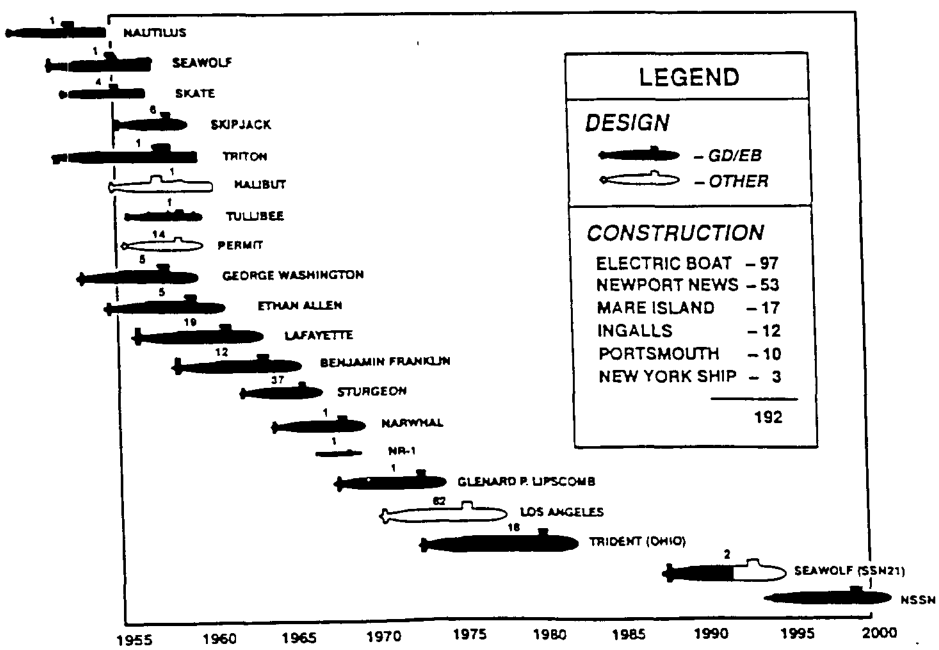
Mr. Chairman, and members of Congress.

I'm Jim Turner, Executive Vice-President of General Dynamics Corporation, and President of its Electric Boat Division.

I would like to thank you for this opportunity to present my perspective on the requirements for continued production of nuclear attack submarines.

As you know, the name "Electric Boat" is synonymous with submarine technology. Electric Boat designed and built the Navy's very first submarine, HOLLAND. Electric Boat designed and built the very first nuclear submarine, NAUTILUS. Electric Boat designed and built the very first strategic missile submarine, GEORGE WASHINGTON. As testament to our design expertise, of the 19 nuclear submarine classes developed in this era, Electric Boat designed 15. Of these 19 nuclear propulsion plants developed, Electric Boat designed 18. Electric Boat has designed the only nuclear power plants in the United States since 1970. Of all strategic missile submarines ever produced by this country, Electric Boat designed every single one. It should be no surprise, then, that the Navy's technical evaluation resulted in the selection of Electric Boat to design and build the New Attack Submarine. On the production side, the Navy has ordered a total of 192 nuclear submarines from 6 shipyards. Electric Boat was awarded more than half. Of the 62 LOS ANGELES (SSN688) Class submarines authorized since FY70, Electric Boat was awarded more than half. All other submarines authorized in the last 25 years — 18 TRIDENTs and 2 SEAWOLF Class — have been awarded to Electric Boat. It is no wonder that Groton, Connecticut — home to our submarine design and final assembly facilities — proclaims itself to be the "Submarine Capital of the World".

ELECTRIC BOAT IS THE WORLD'S PREMIER RESOURCE FOR NUCLEAR SUBMARINE DESIGN AND CONSTRUCTION TECHNOLOGY



Two years ago I testified before your colleagues on the Defense Subcommittee of the U.S. Senate Appropriations Committee. At that time, I stated that one action which would aid us in the defense industry would be for the government to project its basic defense requirements. A predictable business forecast would thus allow us, in industry, to plan our business strategy and adjust our resources and investment to meet market demands. I also indicated that over the longer term, what the nuclear submarine industrial base requires is a national investment strategy, a key element of which would be a new acquisition approach. The principal characteristic of this approach would be low-rate production of fully capable submarines that provide baseline capabilities, as well as the potential for modular, mission-specific reconfigurations. This strategy would maintain ship affordability, mission flexibility and undersea superiority.

Electric Boat is not here asking for a subsidy. We don't need that. We're successfully building down to the very low rate of submarine production ahead. We don't want a handout; what we are seeking is commitment to the OSD, Joint Chiefs of Staff and Department of the Navy plan that delivers the nation's undersea warfare requirements in the 21st century. And it is a commitment that is consistent with the DoD announced policy which was further committed to in the NSSN Acquisition Decision Memorandum. It is a commitment that is equally critical to retaining the national supplier base by assuring them a stable and predictable submarine market in the future.

Today, I note that the Defense Department and the Navy have provided this commitment. The submarine force level requirements have been identified — no, not an absolute number, but rather, a narrow range. What is important here is that it is not a wish list. The requirement is based on our national security needs. In turn, the Navy is implementing a new submarine acquisition approach. It is a plan which maintains the key elements of our submarine industrial base, and more importantly, industrial readiness. It is an affordable plan which provides technologically advanced submarines. And it is a prudent plan based on low-cost/low-risk transition to a new attack submarine.

So, the goal has been defined, and the strategy has been laid out. What remains, of course, is the implementation. I am not here to tell you what Electric Boat is going to do. We're way past the planning stage. I am here to tell you what Electric Boat is doing. I have taken the information that I asked for two years ago — the goal and the strategy — and established Electric Boat's direction. We are now well down the path of reengineering Electric Boat in a manner that will allow the men and women of Electric Boat to continue what Electric Boat does best: build the best submarines in the world for the U.S. Navy at the best value to the taxpayers of this country.

I use the word "continue" purposefully. I would point out to you that every submarine under construction at Electric Boat is either on or ahead of schedule. Every one. And, on March 18, Electric Boat moved the SEAWOLF (SSN21), the world's most capable submarine, onto her launch pontoon for the whole world to view. Not just an artist's rendition. A real submarine, over 82% complete. And close behind, her sister ship, CONNECTICUT (SSN22), now over 40% complete. I would also note here that both these ships were competitively awarded to Electric Boat because we are the low cost builder.

With regard to the Congressionally-mandated cost cap on the SEAWOLF program, Electric Boat is performing to its contractual agreements, and is confident in the scheduled May 1996 delivery of the first ship. Electric Boat is performing to or ahead of contract terms, with every submarine in our backlog. Every one. Even though we are in a near cataclysmic downsizing as we build out the last 688 and TRIDENT submarines. We are achieving these results, in no small measure, because of our reengineering the business. We have been reengineering for two years in order to build submarines affordably at the low production rates we now face. Our thrust has been to provide the United States with affordability through change in process and organization, not to ask for affordability through increased volume in numbers and types of ships. Reengineering now. And getting results now. Before I provide specific details of this, let me leave with you one more thought as to the significance of what's going on here.

When I introduced myself, I mentioned several of the many accomplishments that have resulted in Electric Boat being recognized as the world's premier resource for submarine design and construction technology. There is one other accomplishment that I intentionally reserved to discuss here, in order to put reengineering in its proper perspective.

It occurs to me that, since the advent of naval nuclear power, there have been many evolutionary advances — thousands — in how we design and build nuclear submarines. Laser welding. Sound-isolation mounts. Electronic design. These are but a few. But in all the years since NAUTILUS made her debut, there has been but one truly revolutionary change in how we design and build submarines — the modular design and construction process, pioneered by Electric Boat. It changed everything. We built new facilities around this process — the Automated Frame and Cylinder Manufacturing Facility at Quonset Point, and the Land Level Ship Construction Facility at Groton. By comparison, the old way of producing submarines was analogous to putting a watch together through its stem hole. I mention this revolutionary change now, because I believe we are on the verge of yet another revolutionary change in submarine design and construction.

A change that portends equal significance. A change that is already embedded in our reengineering. It's called Design/Build, or Integrated Product and Process Development, as designated by DoD. It's not a new term. It just has a new meaning. And it's not just a buzz-word or a slogan. It's a revolutionary process for producing affordable submarines, and it is only taking place because it is part of the Navy's strategy for continued production of nuclear attack submarines. From my perspective, without speaking for the Navy or the Department of Defense, the New Attack Submarine (NSSN) program is leading the nation in acquisition reform and integrated product design and development.

Design/Build has new meaning, because now it is more than just our engineers working in concert with the shipyard trades. The Design/Build concept is a team, a team that also includes our suppliers, and most importantly, includes the Navy. And it is a change in how we do business, a change that is affecting Electric Boat so much that, internally, we describe it as a culture change. The Design/Build process in place at Electric Boat has been validated "world class" by an independent Navy review team. I am confident that as you review the specifics of this concept, you will realize how integral Design/Build is to the notion of affordable submarine construction.

As I mentioned earlier, two years ago I identified the needs of industry: Tell us the submarine force level goal; Tell us the strategy for continued production of nuclear attack submarines. These requests have been satisfied. From my perspective, I have no new requirements to add. All I ask of you, the Congress, is: Stay the Course. You have a shipbuilder who is the low-cost supplier. A shipbuilder who is meeting his schedules. A shipbuilder who is financially performing to customer and shareholder requirements. And you also have a team. A team made up of the Navy, Electric Boat, and the submarine industrial base suppliers. This team is working together to deliver an affordable New Attack Submarine. This team is working together in a way that can only be reminiscent of the efforts to produce NAUTILUS and GEORGE WASHINGTON. Let this team fulfill its commitment to you. Stay the Course.

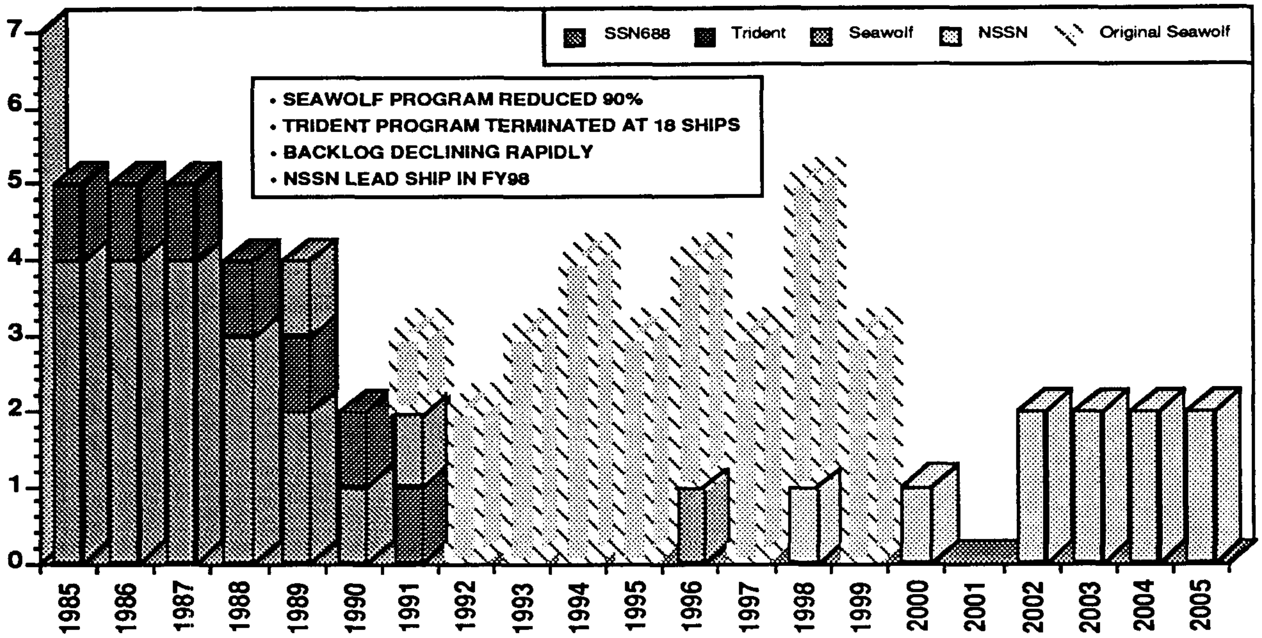
II. PERSPECTIVE

The United States nuclear submarine industrial base embodies fifty years of investment in advancing submarine technology — an investment in dollars, in labor, and in lives. The return on this investment has been the design and production of 192 nuclear submarines, with 9 still under construction.

The end of the Cold War and the subsequent break-up of the Soviet Union in 1991, made it clear that the defense industry, especially the nuclear submarine segment, needed to change dramatically.

The industry is well underway in transitioning from 40 years of Cold War production rates, to a new era of low rate production. The industry has already absorbed a 90% cut in production — from 4.5 ships per year in the '80s to less than half a ship per year in the '90s. The SEAWOLF program was reduced from 29 ships to 3 ships; the TRIDENT program was terminated at 18 ships from a one-time projection of 24.

THE DRAMATIC REDUCTION IN THE SEAWOLF PROGRAM INITIATED A PRECARIOUS TRANSITION PERIOD IN SUBMARINE PRODUCTION



The Navy has developed a plan which preserves essential submarine technology and production and supplier capabilities with acceptable risk at an affordable cost. Independent analysis has validated the plan's assumptions and conclusions. DoD and the Administration support the plan and have requested the funds to accomplish it.

The Navy plan is based on three key points: Low Rate Production of submarines has advantages over shutdown/reconstitution; Two nuclear capable shipyards should be preserved; and the New Attack Submarine (NSSN) must be affordable.

Electric Boat is actively engaged in implementing its portion of that plan: reengineering processes, facilities, and organizational culture so that it can provide an affordable submarine to the U.S. Navy.

III. ENSURING INDUSTRIAL READINESS: LOW RATE PRODUCTION VS. RECONSTITUTION

The long-range Navy submarine procurement plan embodied in near-term SSN23 construction and the NSSN Acquisition Strategy is based on a realistic, comprehensive assessment of future requirements, current capabilities, and cost-effective approaches. Explicit in this plan is the fact that alternatives involving shutdown and reconstitution of some or all segments of the submarine industrial base might well be impossible. Shutdown and reconstitution would be more costly, would involve significantly higher risk, and may fail to meet force level objectives for quiet submarines.

Over the past three years, 14 separate studies have examined the nuclear submarine industrial base. The consensus of these studies is that steady, low-rate production is the optimum and most cost-effective approach to sustaining the nation's capability to design and build nuclear submarines. Not a single study recommended the shutdown and reconstitution option.

The nuclear submarine is an exceptionally complex engineering and manufacturing undertaking representing an unusual combination of nuclear power, sophisticated electronics and cold steel. Applications of these seemingly incompatible partners must be made with strict requirements for safety and exceptional attention to detail in all areas of the design, construction, testing and operation of the nuclear submarine. Attendant with these strict requirements is the equally complex task of integrating all the component parts into a single product.

Construction and engineering personnel work very closely with one another and rely heavily on the experience and knowledge gained from each other to improve construction efficiency and technology. Critical manufacturing skills and specialized technologies such as modular sectional construction, material test and development, stealth and acoustic technologies are all utilized, improved and rigorously challenged in the nuclear submarine shipbuilding environment.

As ADM DeMars said in his report on the preservation of U.S. Nuclear Submarine Capability, *"Experienced ship and equipment designers cannot sustain their skills or generate useful products without the constraints of production line and waterfront reality. Paper designs always appear to work — the problems are in building and operating equipment."*

Barriers exist to reopening facilities tailored to submarine construction. Requalification of suppliers would be costly and time-consuming. DoD studies have found "long lead" times of up to 9 years between order and first delivery of nuclear materials. Environmental restrictions could impact processes or equipment which had ceased to be "grandfathered". Uncertainty of the future business outlook would discourage corporate retention of key facilities or re-investment in new facilities. Valuable waterfront property would most likely be converted to other uses.

Shutdown and reconstitution costs would undoubtedly exceed the proposed low rate production outlays. The RAND study indicates an aggregate shutdown/restart cost of at least $2.0 to $3.5 billion, not including the costs associated with increased programmatic risk, loss of contingent employment and revenues to state and local governments, and other social welfare costs. Further, RAND concedes that initial estimates are apt to underestimate actual returned costs by 50%–300% due to the uncertainty and risk involved. The current Navy submarine acquisition plan spends $1.5B on SSN23, for which you get a state-of-the-art submarine, and avoids the unbounded shutdown/reconstitution costs.

Start-up introduces unacceptable costs and risks into any submarine program. Startup of a nuclear shipbuilding program was difficult when the technology was in its infancy, and might well be impossible today. Consider the problems experienced at Ingalls and New York Shipbuilding when they were awarded SSN construction contracts in the '60s. Even the Quincy Division of General Dynamics, which drew on Electric Boat for expertise, experienced problems.

Recalling skilled personnel is apt to be ineffective, as top performers find secure jobs elsewhere. Rapid buildup with green labor results in skill mix dilution, impacting productivity and quality. Not least of all, the mindset of documented perfection — required for SUBSAFE, nuclear reliability and safety — would take years to regain.

Supplier Base

Nuclear submarine construction requires a multitude of different materials, technical skills and manufacturing processes. The sheer diversity of the requirements dictates that the supplier base be large and specialized. The submarine market never has been and never will be a "volume" business for that supplier base.

The supplier base consists of approximately 600 major equipment suppliers and approximately 3,000 firms when subtier and commodity suppliers are included. Some of these suppliers are small firms who are virtually totally dependent on submarine orders for their business. Others are large companies which devote only a fraction of their capacity to the design and manufacture of nuclear submarine components. These suppliers design and manufacture submarine equipment and components which range from nuclear propulsion equipment, to quiet pumps, valves, and motors, to submarine command, control and combat systems. Due to the special requirements of stealth, submarine safety and nuclear propulsion, most of the components made by the submarine supplier base are unique and unavailable elsewhere. The loss of critical suppliers could create serious disruption of submarine construction programs. It is important to appreciate that the technical skills involved in designing and manufacturing critical submarine components are possessed by a small population of people in a number of vital companies. Once lost, the skills of this relatively small number of designers, engineers and craftsmen would be very difficult to replace.

Because of the four year hiatus since the last authorization of a new construction contract and the continuing uncertainty regarding future submarine construction, many small suppliers who were heavily dependent on the submarine market have been forced to close their doors. Likewise, many large firms have concluded that they could no longer justify maintaining a presence in a niche market that required technical and production skills with only limited application in other (e.g., commercial) markets. As a result, the submarine industry is increasingly dependent on single and sole source suppliers.

To adjust to the erosion of the submarine supplier base, Electric Boat has conducted a detailed analysis and is working to maintain qualified suppliers in the areas of concern. Many suppliers have already completed their orders for both SSN21 and SSN22. Of particular concern are the non-nuclear suppliers who are relying on SSN23 for continued viability. Through a combination of advance procurement for SSN23 and advance engineering involvement on the NSSN, suppliers who are in the most precarious position and most critical to future submarine programs are being encouraged and sustained. As a result of these efforts, adequate suppliers remain to support the construction of SSN23 and the NSSN as presently scheduled. However, unless long term predictability is returned to the marketplace, it will be impossible to halt the exodus of more firms. And once the incumbents have exited, it will be difficult to attract new entrants given the investment required and the modest market projected.

IV. ENSURING INDUSTRIAL READINESS: TWO NUCLEAR CAPABLE SHIPYARDS

The Navy plan for submarine acquisition recognizes the significant advantages to the government and national defense in maintaining two shipyards capable of designing and building nuclear powered ships. Both the intangibles of risk and future uncertainty, and the very concrete elements of cost and current capability, have been factored into the Navy position.

This policy was most recently expanded upon by the ASN, RD&A Report on the Navy Submarine Acquisition Plan which concluded that the Navy's current plan will:

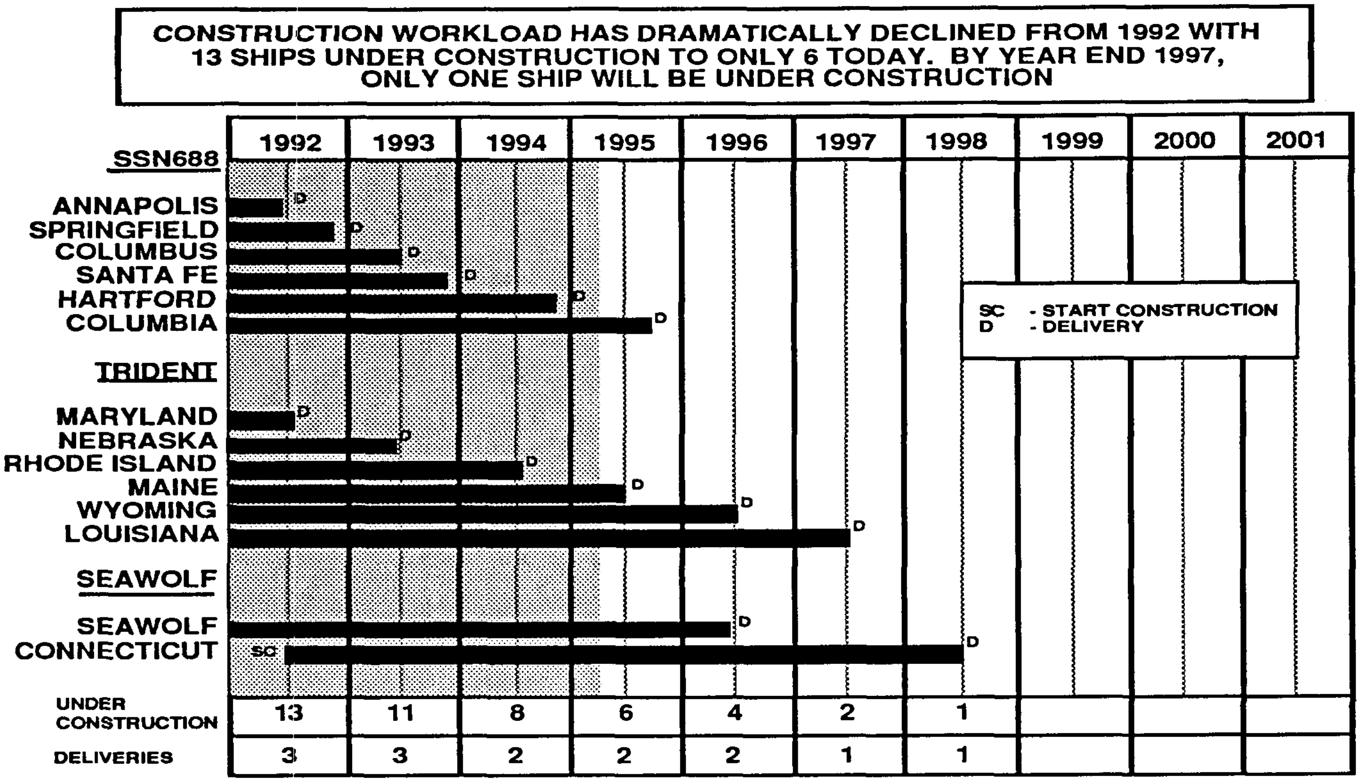
" • minimize submarine construction costs and risks over time;
- sustain the industrial base for submarines and nuclear components;
- preserve invaluable leverage that comes with having the option of competition; and
- enable transition to an affordable, capable, and flexible attack submarine fleet."

Assigning carrier production to Newport News and submarine production to Electric Boat keeps two nuclear capable designers and builders active. In the event of a natural disaster or economic work stoppage, the Navy can count on one nuclear shipyard remaining active.

Under the Navy's acquisition plan, the two nuclear capable shipyards will not be competing head-to-head for submarine construction contracts during the transition period of the NSSN program. However, the potential for competition, and the Navy ability to compare prices and rates on nuclear construction work, will continue to exert downward pressure on negotiated contracts at both shipyards. In addition, maintaining two nuclear capable shipyards supports industrial readiness goals, should changes in the future strategic environment demand higher production rates.

Implicit in the Navy decision to maintain two nuclear capable shipyards is that it is ultimately the most cost-effective and low-risk way to manage the technological development and production of future classes of nuclear powered vessels. Electric Boat fully supports that position, and the acquisition strategy which is consistent with it.

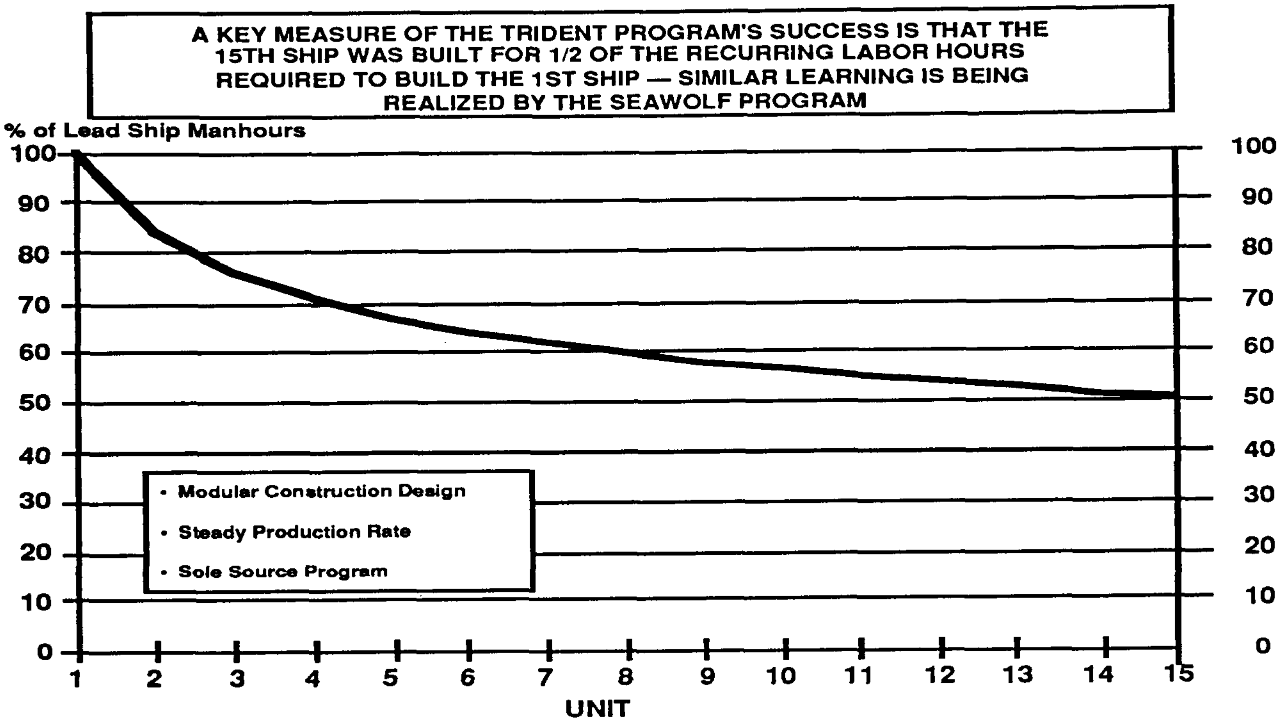
V. PROGRAM STATUS



OHIO CLASS (TRIDENT) PROGRAM

Electric Boat has been the sole designer of strategic missile submarines (SSBNs) for the United States Navy, and is the designer and sole builder of the Navy's current SSBN program, the TRIDENT. As an integral part of the United States nuclear deterrent strategy, the TRIDENT's basic mission is to remain hidden at sea, equipped with nuclear-armed ballistic missiles, and thereby deter a strategic attack on the United States. As the sole surviving shipyard that has designed and built both SSBNs and SSNs, Electric Boat's contribution to the nation's ability to maintain a viable deterrent capability is unique and irreplaceable.

The United States Navy has awarded Electric Boat construction contracts for 18 TRIDENT Class submarines since the inception of the TRIDENT program in 1970. The TRIDENT construction program is scheduled to be completed upon delivery of LOUISIANA to the Navy in June 1997. As of today, Electric Boat has delivered 15 of the TRIDENT Class submarines to the Navy, all ahead of schedule. The next TRIDENT submarine , MAINE, is targeted to be delivered in June 1995.



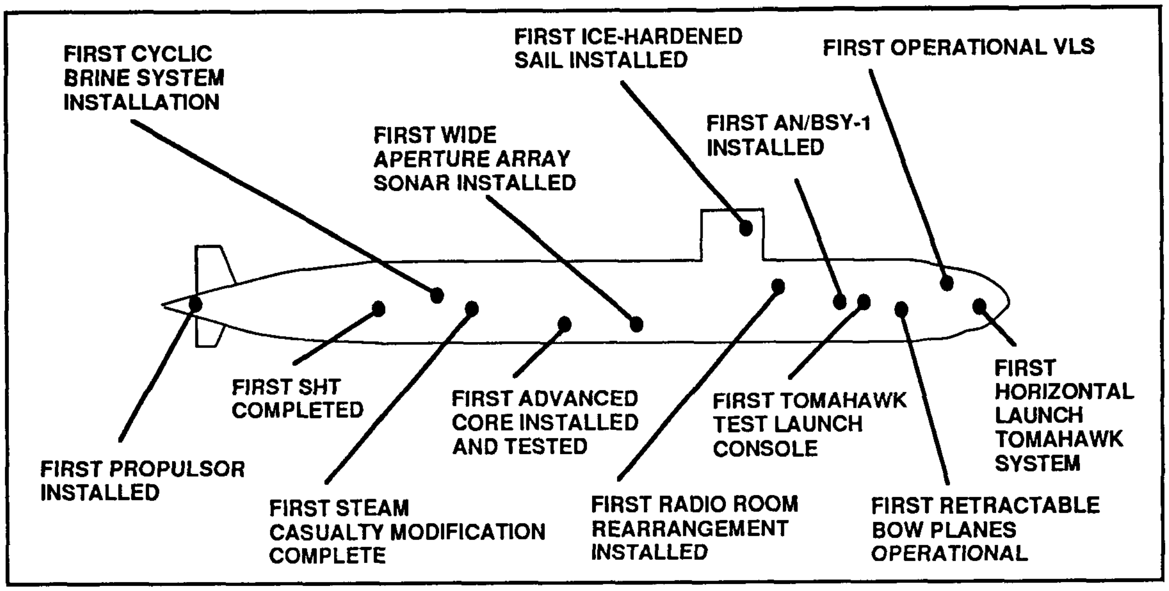
Throughout the TRIDENT program, Electric Boat has consistently achieved significant labor reductions per ship. During the course of the TRIDENT program, Electric Boat introduced automated hull cylinder fabrication, a manufacturing process which has revolutionized the construction of submarines. This process has permitted Electric Boat to adopt a modular construction technique whereby sections of the submarine hull are substantially outfitted with internal components at Electric Boat's Quonset Point, Rhode Island facility. The hull segments are then assembled at Electric Boat's land-level submarine construction facility in Groton, Connecticut. A key measure of the TRIDENT program's success is that the 15th ship was built for 1/2 of the recurring labor hours required to build the 1st ship.

LOS ANGELES (SSN688 CLASS) PROGRAM

Electric Boat is the principal manufacturer of attack submarines (SSNs), including the SSN688 Class fast attack submarine. In 1970, the United States Navy began procuring the SSN688 Class submarine, an attack submarine which is faster and better-armed than its predecessors. The final 31 ships of the SSN688 Class are equipped with a vertical launch system for carrying 12 Tomahawk cruise missiles in addition to the 25 weapons. Electric Boat was awarded construction contracts for 33 of the 62 SSN688 Class submarines procured by the Navy, despite the fact that Electric Boat was not the lead designer of the SSN688 Class.

As acknowledged by the aforementioned Navy Report on Submarine Acquisition, "Electric Boat is used to resolving systemic submarine fleet problems, improve existing capabilities, and handle the demanding first-of-a-kind technology insertion projects which require experienced engineering support. For example, Electric Boat designed and built the first Vertical Launch System for cruise missiles for SSN688 Class submarines. Electric Boat developed the installation design for the first Wide Aperture Array on SSN688 Class, the first propulsor, and completed the redesign for installing the first BSY-1 combat system on SSN688 Class."

SSN688 Class Program — Electric Boat "Firsts"



As of today, Electric Boat has delivered 32 of the SSN688 Class submarines in the Navy. Electric Boat will deliver its final SSN688 Class ship to the Navy in the third quarter of 1995.

During the course of the SSN688 Class construction, Electric Boat applied the modular design and construction techniques it developed during the TRIDENT program to the SSN688 program. As a result, Electric Boat was able to increase the degree of modularization of the ship's construction from approximately 10% to 50%, thereby achieving substantial efficiencies. For example, Electric Boat has reduced by up to 19 weeks the costly construction period between hull completion and delivery. It also has significantly reduced the wet dock construction period, which is the period from launch to delivery.

SEAWOLF (SSN21) CLASS PROGRAM

Electric Boat is currently building SSN21 (SEAWOLF) and SSN22 (CONNECTICUT), the lead and second ships of the SEAWOLF Program. Electric Boat was awarded the contracts to build these ships in direct competition with Newport News Shipbuilding.

In contrast to historical evidence which indicates program stability is a key characteristic of successful weapons systems, the SEAWOLF submarine program has been tumultuous. In 1990, as a result of the Major Warship Review, the program's production rate was cut in half. Subsequent reductions and rescissions in 1991 and

1992 further truncated the program to the three ships currently under construction or planned — a 90% reduction over a span of just three years. Despite the program's instability, Electric Boat's SEAWOLF construction program has been well run and continues to perform within the terms and conditions of the contracts.

SSN21 (SEAWOLF) is 82.2% complete. On Saturday, March 18, the ship was moved from our main assembly building onto the Land Level Construction Facility pre-launch position in preparation for Float-Off which occurred on April 27, this year. The ship will be christened on June 24, 1995 and is on track to delivery to the U. S. Navy on May 24, 1996.

The second SEAWOLF ship under construction at Electric Boat, SSN22 (CONNECTICUT) is over 40% complete. Electric Boat has realized a significant learning advantage by applying SSN21 experience to the second ship. The actual manhours required to complete an identical portion of work on SSN22 averages just 85% of the hours spent on SSN21. This performance improvement matches the learning curve of the TRIDENT program. This ship is also on track to its scheduled delivery in June 1998.

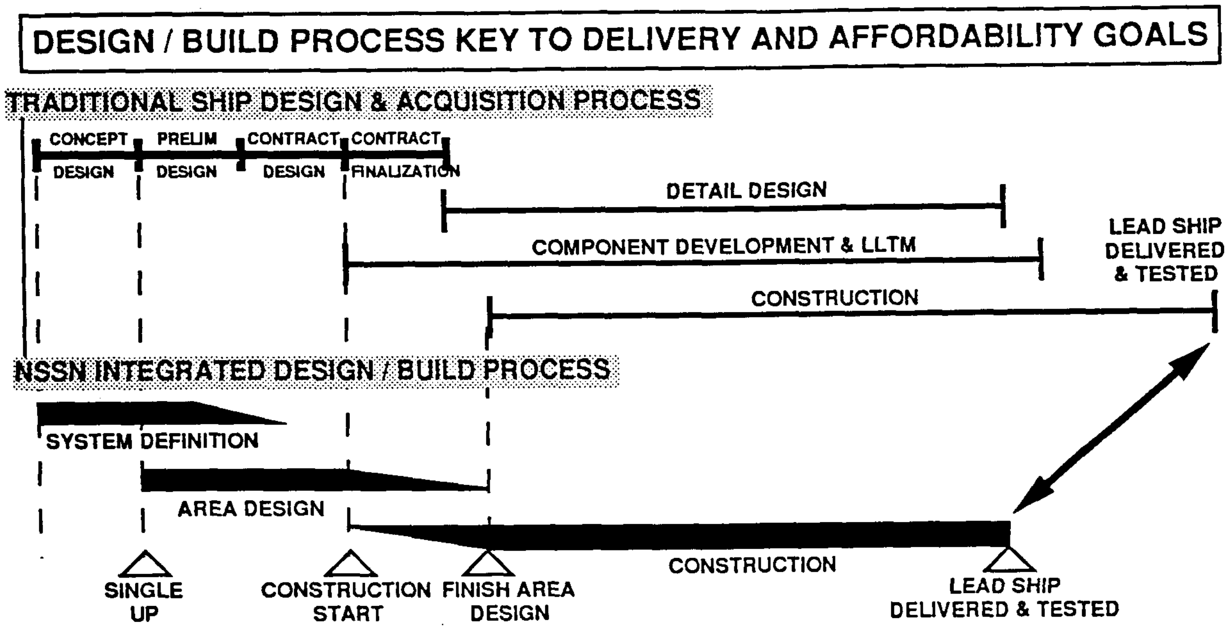
Electric Boat's objective for the SEAWOLF construction program is clear: Deliver the SSN21 and SSN22 in the most cost effective manner in support of the Congressionally mandated cost cap. Electric Boat will meet that requirement through continued progress in the integrated shipbuilder/Navy management approach which has recently been implemented at the direction of Assistant Secretary Slatkin.

VI. NEW ATTACK SUBMARINE (NSSN) PROGRAM

It is clear that submarines will continue to play a vital role in the force of the future. It is equally clear that they must be acquired affordably because of the constraints of the Navy procurement budget. The objective, therefore, is to design and build the most cost-efficient platform fully capable of performing safely, effectively, and reliably in all projected operating environments. A secondary goal is to acquire such platforms at the right time and in the right numbers to meet force levels. The procurement plan put in place by the Navy represents a major step toward acquisition reform and is the best strategy to transition from the SEAWOLF to the more affordable NSSN.

The Navy has applied several key initiatives to NSSN acquisition, all designed to reduce cost and ensure affordability. These initiatives include both new ideas and application of "lessons learned" from previous successful programs.

Selection of a single Design/Build contractor for the lead NSSN is key to achieving the advantages of the Design/Build process, both from an acquisition streamlining standpoint and from a design development position. The NSSN acquisition approach and Design/Build process, as illustrated below, has enabled the Navy to shorten the overall acquisition cycle dramatically. It enables the Navy to make the most meaningful cost/capability/schedule tradeoffs, and to minimize the traditional liability associated with the Navy warranting the design to the builder. The acquisition strategy and contract structure envisioned places the Navy, the designer/builder, and the supplier base in partnership to produce the most affordable product.



The Design/Build partnership allows Electric Boat to capitalize on our unique manufacturing and production work practices and facilities. Further economies are being realized because the early single-up decision permits an integrated product and process development. This Design/Build approach focuses on the parallel development of products and their manufacturing process. This approach reduces product development time and cost by considering all elements of the product life cycle — from conception through disposal — including quality, cost, schedule, and user requirements. Realizing these benefits, many other companies have also started to use this approach as the basis of their future competitive strategies. It is significant to point out that in March of 1994, an independent Navy review team validated Electric Boat's Design/Build process, and favorably compared it to world leaders such as Boeing, Chrysler, and Northrop.

Design development has focused on "cost based platform" production. Use of existing components and systems design is being planned to minimize design and production cost. Commercial components and standardized parts will also be used, to a degree never before achieved, abetted by innovative approaches to configuration, arrangement, and deck structure. In addition, production costs will be minimized by concentrating outfitting and assembly in a factory environment rather than within the shipyard.

Current NSSN design development optimizes design modularity. In addition to applying modular construction efficiencies, it provides the operational benefit of reconfigurability for multi-mission requirements, and the capability for upgrades and insertion of new technology without the traditional barriers to change.

Development of the conceptual ship design and propulsion plant is proceeding rapidly at Electric Boat. Already, the advanced electronic design systems and methodology being developed and employed on the NSSN have created a product model for the design and construction of the ship. This is far beyond what would traditionally have been available at the conceptual stage, and enables development and validation of systems, components, and modules to proceed in accordance with an integrated schedule, well before construction of the ship begins. All participants — the Navy, Electric Boat, and the myriad of critical suppliers — are working together to the same targets for decision making, design, and production. This will significantly reduce the contract change activity which has traditionally challenged new designs.

VII. REENGINEERING THE BUSINESS

Electric Boat's management believes the changes to defense spending levels of the last several years are both structural and long-term. As such, these market changes demand significant and enduring changes to the way we have done business. Electric Boat has initiated major changes in the design, production, and processes to meet the dual challenge of affordability and very low rates of production.

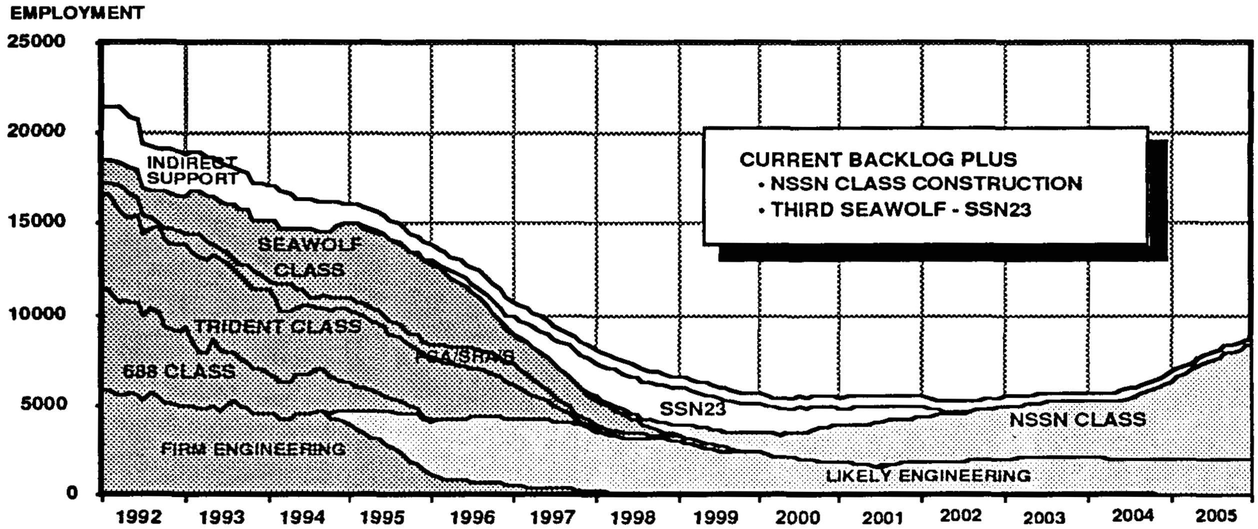
Electric Boat is presently in the midst of reducing submarine production from 3 ships per year during the early 1990's to a projected level of 1/2 ship per year through the remainder of the decade. The current production backlog runs out in 1997–1998, with completion of the last TRIDENT Class submarine and the second SEAWOLF, SSN22. Electric Boat employment, which exceeded 22,000 in 1992, has been reduced to approximately 15,250 through layoffs and attrition.

In 1989, in anticipation of a highly competitive SEAWOLF program, Electric Boat management began a concerted effort to reduce costs. These efforts, although successful, were still based on projected production levels of one or more submarines per year. With the abrupt truncation of the SEAWOLF program, it was apparent that a much more aggressive approach would have to be initiated if Electric Boat was to preserve the value in our backlog and position ourselves for future levels of low rate production. In response to this challenge, a Division-wide reengineering effort was initiated in mid-1993 to ensure the future viability of the business and the affordability of its submarines.

The first step in our reengineering process was to look beyond our backlog. Electric Boat evaluated a comprehensive set of options and strategies in order to develop a realistic business forecast. Recognizing the uncertainty and risk in this market, a thorough assessment of market opportunities was conducted covering submarine design and construction, overhaul and repair, and commercial business. As a result of this assessment, a decision was made to focus on continued submarine development and construction. Finally, a business forecast was developed: SSN23 award in FY96, NSSN design and construction in FY98, limited follow-on NSSN construction, and a conservative level of design and related support services.

This minimal, and protracted level of business has dramatically impacted our projection for business volume and mix. Given our forecast, we believe that Electric Boat employment will eventually drop to approximately 6,000 by 1998.

DRAMATIC VOLUME REDUCTION AND CHANGE TO WORKLOAD MIX REQUIRES A REENGINEERING OF PROCESSES AND ORGANIZATION TO REMAIN AFFORDABLE. RATIONALIZATION ALONE WON'T WORK



More importantly, however, this business forecast has also led to the development of Electric Boat's strategy for success in the new defense environment: Reengineering to maintain affordability. The implementation of this strategy has been underway for two years, and we are meeting our goals. Aggressive financial overhead targets have been established, based on a realistic assessment of projected business. Every process is being evaluated and reengineered, as appropriate, to drive out cost in order to meet plan targets. And, finally, improved management systems are being installed to closely monitor and control the plan.

The approach is to complement incremental cost reductions with step improvements in performance. These step improvements are derived from a fundamental redesign of cost structures and operating practices, not by scaling down current activities and infrastructure, but through a clean-sheet, minimalist redesign.

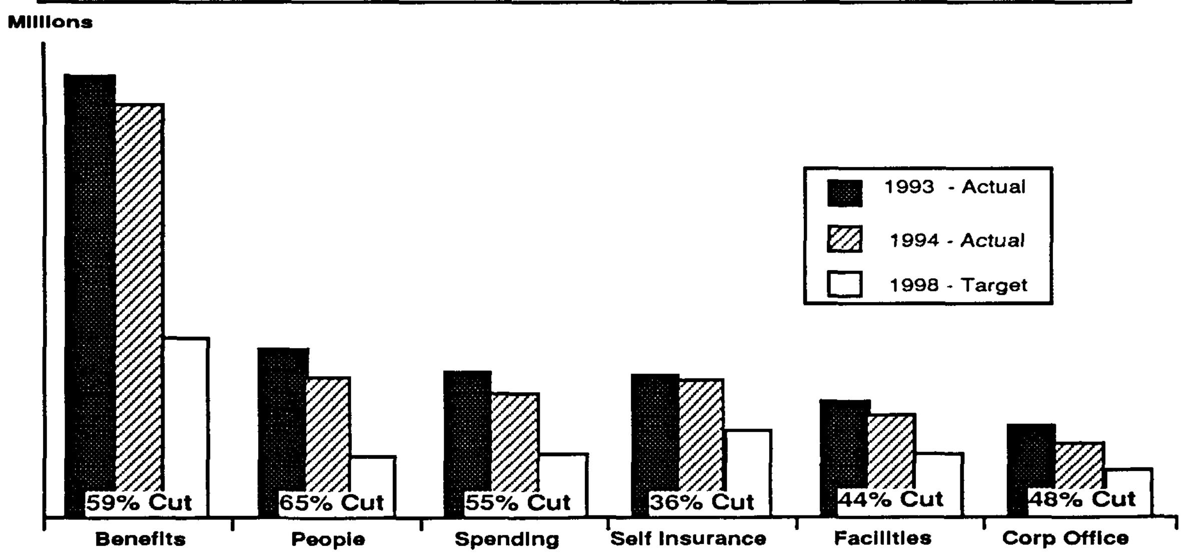
All of the Division's functional areas are being subjected to this process. At the outset, Electric Boat set aside traditional organizational structures and grouped functions into three broad areas: Innovation (Program and Product Development), Delivery (Manufacturing and Construction), and Strategy and Finance Systems (Finance, Information Management Systems, Human Resources, and Cost Control Management). This restructuring has immediately begun to break down traditional communication barriers and organizational silos, actions essential to successful reengineering. As the process evolved, cross-functional teams were also established.

Reengineering is having an effect now and will continue with NSSN. Reengineering efforts are focused on achieving affordability by reducing all costs. Indirect Costs, those general costs of doing business which are not directly related to a specific product, are being aggressively reduced across the company. Reductions in Direct Costs, the labor and material used to design and build the product, are being managed through a top down management assault, reengineering and productivity teams, and a careful monitoring of labor mix across all programs.

As the process evolved, additional teams were formed to pursue key cost reduction initiatives. For example, the "extended enterprise" team has taken Electric Boat's vision for affordability and productivity requirements to our suppliers. The facilities team is driving out the cost of facilities, within the framework of remaining a fully capable shipyard and preserving key capabilities at both Quonset Point and Groton. Productivity teams are also in place including Design/Build, Engineering Best Practices, Systems, and Management and Control. All aimed at driving out the cost of producing nuclear submarines.

As part of Electric Boat's reengineering, all overhead costs have been structured into six categories based on the management actions required to address them. These cost categories are: corporate allocations, footprint (facilities), general spending, self-insurance, benefits, and overhead people. Each of these categories was analyzed in detail, to determine fixed and variable cost, and aggressive financial targets have been set to meet 1998 low rate production goals.

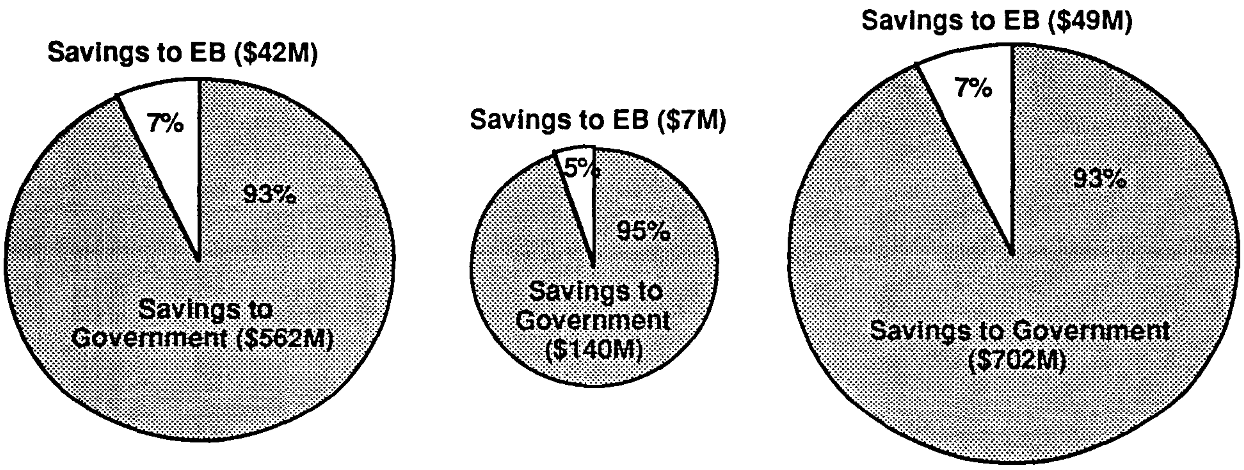
OVERHEAD COST CATEGORIES HAVE BEEN ANALYZED IN DETAIL AND COST REDUCTIONS ARE BEING MET. AGGRESSIVE FINANCIAL TARGETS HAVE BEEN SET TO MEET 1998 LOW RATE PRODUCTION GOALS



Levels of property, plant and equipment are being reduced. To date, Electric Boat has ceased operations at two major remote facilities. Both of these sites, along with a 200 acre waterfront property on the Thames River in Waterford, Connecticut have been sold. Excess equipment is being surplused as soon as possible; long standing lease agreements being reduced or terminated; older buildings are being razed; and, where feasible, access will be restricted in areas where future activity is low-use.

To date, Electric Boat's reengineering efforts have resulted in the elimination of over $600 million in overhead costs from the business plan from 1994–2001. Continuing these efforts, the Division fully expects to achieve its goal to cut an additional $150 million in cost over this period. These cost savings are being realized on work currently under contract and will reduce the cost of all future work as well. Additionally, it is most important to note, that approximately 95% of these savings will accrue to the Government, resulting in the delivery of more affordable ships.

AGGRESSIVE COST REDUCTIONS MEAN SIGNIFICANT COST SAVINGS ARE BEING REALIZED ON CURRENT WORK AND FUTURE PROJECTED WORK



Current Savings = $604M | **Additional Projected Savings = $147M** | **Total Savings Projected Over 1994 - 2001 = $751M**

Overall, Electric Boat's vision has remained firm, providing much needed stability and continuity amid rapid change. Some modifications to implementation have been made, some necessitated as a result of reengineering, others brought about by market changes.

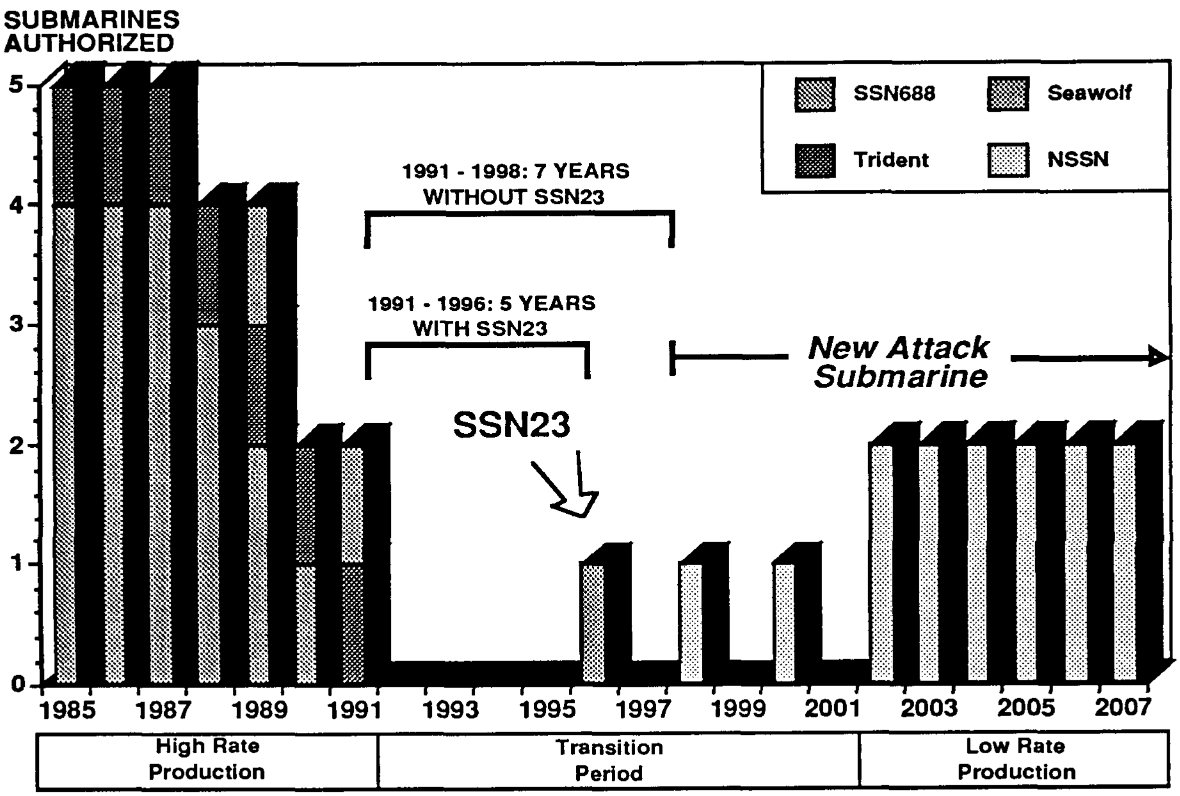
Our results clearly demonstrate Electric Boat's determination to meet the demands of the Navy and the Congress to provide quality submarines at an affordable price.

VIII. SSN23 COMPLETION

The last submarine authorized for construction was the SSN22 in 1991. If the lead NSSN is the next ship to be built, there would be a seven year gap in submarine production forcing the industry into a shutdown/reconstitution mode for nuclear submarine production.

Turning off this highly skilled, truly unique industrial base — and then trying to restart it later — imposes great costs and unacceptable risk. The supplier segment of the industrial base would not survive without the SSN23. Many suppliers of submarine-unique components would be forced to leave the business or to close their doors. The submarine industrial base cannot sustain a seven year gap, therefore a production "bridge" is required.

SSN 23 - FIRST SUBMARINE AUTHORIZED IN 5 YEARS



The logical alternatives for this bridge are an SSN688I or a third SEAWOLF. Reopening of the SSN688I production line would result in a total cost of approximately $1.5B for another SSN688I. SSN688I production costs could be even greater due to the shutdown/restart of the SSN688I production line and the possible unavailability of certain unique components. The third SEAWOLF would cost about the same due to the amount of funding already appropriated for material and components. Since a SEAWOLF, a far more capable platform than an SSN688I, could be procured for about the same price as an SSN688I, the third SEAWOLF is the most prudent choice for a production bridge.

Completing SSN23 enables Electric Boat to refine SEAWOLF "lessons learned" and further capitalize on construction learning efficiencies. In all the studies and discussions surrounding the issue of building the SSN23, it is easy to lose sight of our objective. Our objective — Electric Boat's and the Navy's — is a modern, capable nuclear submarine force for the 21st century. The means to achieve that objective is an innovative, active and technologically advanced submarine industrial base. Building the SSN23 ensures that the means will be there when we need it.

The SSN23 also represents a transitional link to ensuring affordability on Electric Boat's current construction backlog and future NSSN workload, thus avoiding large reconstitution costs. In testimony provided March 16, 1995 the Navy estimated the cost impact of not building SSN23 to be approximately $700M - $1B plus the potential for additional intangible costs in the hundreds of millions of dollars.

Subsequent statements by CNO Boorda have reaffirmed this and pointed out that, in addition to the $900M already committed to the ship, the cost of not building SSN23 would not save the $1.5B requested. Once termination costs and added overhead charges to current backlog and the NSSN are included, the costs of not building SSN23 would be $700 - $1.1B. The cost of refueling an SSN688 to meet force levels would further increase the costs of not building SSN23.

In addition to being the right decision from an industrial and cost perspective, completing SSN23 is the right decision for military capability. The Navy has stated that the SSN23 SEAWOLF will provide a needed warship, combat ready for any threat environment.

IX. NEW ATTACK SUBMARINE COMPETITION

Historically, the Navy needed at least two submarine construction sources in order to meet production requirements. Therefore, the Navy contracted with one of the builders as lead design yard to prepare a generic detailed design and/or procure components that were provided to the builders as Government Furnished Information/Government Furnished Equipment (GFI/GFE). Since all builders need to be treated equitably, the Navy would, via contractual clauses, warrant the timeliness and accuracy of the GFI/GFE to both builders. This in effect had the Navy warranting the designer's own data to his construction branch, a virtual invitation for claims against the government should problems develop during construction.

Consistent with the Navy's approach for GFI/GFE, the Navy was very careful that none of its actions would provide an advantage to one builder vis a vis the other builder. This resulted in minimal communication between the builders and the Navy during the several years of design activity that preceded the actual construction award. This prevented early identification of production problems, inhibited implementation of cost effective design changes, resulted in longer procurement schedules, and discouraged the structuring of contractual vehicles that provide incentives for significant cost savings.

The proposed NSSN integrated design/build contract is a significant departure from the traditional approach. The Navy consciously took the lessons learned on the SEAWOLF, as identified by the GAO, and developed an acquisition strategy which concentrated responsibility for design and lead ship construction in a single shipyard. Early selection of the lead design yard was, in fact, the competition for the program, and enabled implementation of the design/build acquisition strategy. This strategy reduces risk, affixes responsibility, and results in significant lead ship savings.

Design/build is more than just the submarine design and construction sides of the shipyard working together. The process encompasses the up-front participation of the principal suppliers and the Navy technical codes and program management functions in the detailed design development and cost/capability tradeoffs which are critical to NSSN affordability. In addition, because the design is tailored to the processes and capabilities of one yard, rather than being a generic product, numerous cost savings result which can be allowed for in the contractual terms and conditions, benefiting both the shipyard and the Navy.

Electric Boat has conducted an analysis of the impact of NSSN competition. This analysis had determined that for any competition scenario prior to the NSSN program reaching production rates which would support viable competition, the costs to "level the playing field", will increase the costs of submarines over the foreseeable future — no matter who wins the NSSN competition.

From a financial and risk management standpoint, competition should be conducted in the NSSN program when it provides the most advantage to the government, not when it is convenient for industry. The Integrated Product and Process Development environment currently in place on the New Attack Submarine program necessitates lead ship construction at the lead design yard. GAO lessons learned on the SEAWOLF program show this to be the lowest cost approach, and it is consistent with other shipbuilding and aircraft building programs. Once the design is validated in production, then competition should occur when production rates support introduction of a second builder. Premature competition will drive up costs unnecessarily and risk permanent loss of Electric Boat. Suggested action to mandate NSSN competition would in fact eliminate future competition. The two yard strategy is the only way to ensure competition over the long term.

The two nuclear yard strategy is sound as long as it is not cost prohibitive. The Navy has indicated that the cost to maintain two nuclear shipyards is relatively low, while the value of maintaining two yards is high. Furthermore, they have stated that a key benefit of the two yard strategy is "preserving the leading edge in submarine design by retaining the Groton shipbuilder — vital given our narrowing margin of U.S. undersea superiority."

Lastly, Electric Boat believes that the $2B cost saving claimed by Newport News for the first five NSSNs is not achievable.

Because the details of the Newport News claim are not yet available for analysis, the following estimate, presented to the National Security Subcommittee of the House Committee on Appropriations on April 5, 1995, is provided. Summarizing our analysis, there is about $500M of other overhead, a portion of which could be saved, but only a small fraction of the $2B savings as claimed.

This analysis is based on known NSSN programmatic values and several standard ratios which have been and continue to be applicable to nuclear submarine construction. Specifically:

- The total SCN projection for the first five NSSNs is estimated to be $11.1B, based on FYDP funding projections, a $1.5B USN target cost for the fifth ship, and appropriate learning curve assumptions for the five ships identified in Newport News' claim.

- The shipbuilder share of SCN cost is approximately 45%. The government expends 55% of the funds directed for Government Furnished Equipment (GFE) such as nuclear components, propulsion plant equipment, and combat systems, for Program Management and Supervisor of Shipbuilding activities, and for logistics and other services and materials. Currently, the shipbuilder's share of SSN21 is ~50% and SSN22 is ~41%.

- A reasonable profit rate on Navy ship construction is at least 10%. The SSNs currently under construction at Electric Boat and Newport News average 11.8% and 12.2% profit, respectively.

- Approximately one-third of the shipbuilder share of SCN goes directly to suppliers for construction material. SSN21 and the latest TRIDENTs are running ~36% material, while the last SSN688 is under 30%.

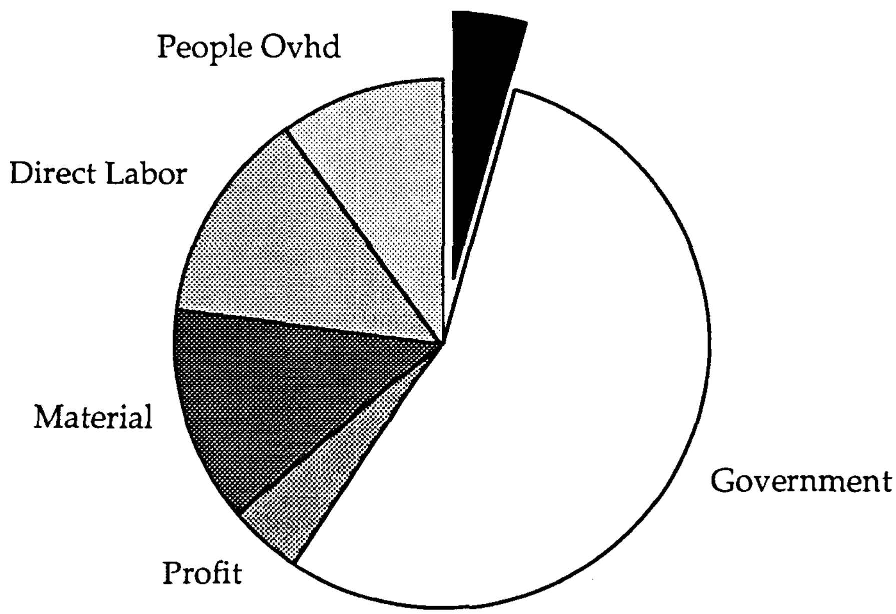
- Of the shipbuilder cost for direct labor and all overhead, approximately 45% goes to direct labor. Current attack submarine contracts are all in this range.

- Of total overhead, approximately 70% is people-related. In fact, Newport News has recently cited this ratio in their employee newspaper in discussing the need for benefit cost reductions. These costs, such as FICA, holiday and vacation pay, medical and dental benefits, etc., are assumed to be variable overhead costs associated with the labor to construct the ship, and would be incurred by Newport News with the construction work. Even this ratio overstates the potential savings, since it assumes that all of the fixed costs associated with submarine production at Electric Boat would be avoided by Newport News.

The net result of applying these admittedly approximate but clearly appropriate ratios to the question of potential savings from shared overhead results in maximum potential savings of ***less than $500 million*** — a long way from $2 billion — as shown below:

Total SCN for first five NSSNs	$11.1 B
Less Government share of SCN (55% of above)	($ 6.1 B)
Shipbuilder share of SCN	$ 5.0 B
Less reasonable profit (10% of above)	($ 0.5 B)
Total shipbuilder labor, material, and overhead	$ 4.5 B
Less Material costs (33% of above)	($ 1.5 B)
Total shipbuilder direct labor and overhead	$ 3.0 B
Less direct labor costs (45% of above)	($ 1.4 B)
Total overhead costs	$ 1.6 B
Less People related overhead (70% of above)	($ 1.1 B)
Maximum potential overhead subject to spreading (only a portion of which could be realizable savings)	$ 0.5 B

Maximum Potential Overhead Subject to Spreading



X. CONCLUSION

In summary I would like to stress four issues:

1. Electric Boat is committed to remaining the premier resource for nuclear submarine design and construction technology. Our Program Performance and Reengineering initiatives demonstrate our commitment to affordability and excellence.

2. The current Navy/DoD plan is the right course to follow. It ensures a viable nuclear submarine industrial base is preserved and an affordable and capable submarine is ready for future force level requirements. The FY96 funding request for SSN23 and NSSN is crucial to implementing this plan.

3. Mandating competition for the NSSN Program at this point would add cost to the program, and essentially negate the efficiencies of the Design/Build process which is well underway, as well as adding cost associated with maintaining involvement of two shipyards and the bidding process itself.

4. The funding decisions you make this year will be the most important ones you will ever make for the future of the nation's nuclear submarine programs, and perhaps the most important decisions ever made for the future of nuclear shipbuilding. Any divergence from the planned structure and funding requests will jeopardize the national ability to provide fully capable and affordable nuclear submarines.

Thank you for this opportunity to present my views.

Document Separator

STATEMENT OF W. P. ("BILL") FRICKS, PRESIDENT, NEWPORT NEWS SHIPBUILDING, BEFORE THE SEAPOWER SUBCOMMITTEE OF THE SENATE ARMED SERVICES COMMITTEE ON MAY 16, 1995

Mr. Chairman and Distinguished members of the Subcommittee, good morning.

My name is Bill Fricks. I am President of Newport News Shipbuilding, a Tenneco Company. Newport News is a private sector company. As President of the Company, I have a profound responsibility to our shareholders and our employees to compete for contracts when we are fully qualified and capable of performing the work. We must not only compete -- we must compete aggressively by seeking out every business opportunity and delivering the best ships at the lowest possible cost.

Today, most unfortunately, we have a major disagreement with our best customer, the United States Navy. We want to compete for the opportunity to build the New Attack Submarine. We have been told "Don't even apply." The Navy wants to sole-source this program to the Electric Boat Division of General Dynamics.

Clearly, this is a matter of great importance because it involves the future security of our nation and the stewardship of billions of dollars of taxpayers' funds. Only Congress can resolve this dispute, and Congress must evaluate a number of factors in reaching its judgment. The excess capacity presently existing in the United States shipbuilding industry and the resultant higher costs per ship mandate that the industrial base must be rationalized. We have entered a new era; the industrial base must change with it or the Country will not be able to afford the ships it needs. I believe if the Navy continues with the outdated strategy of parcelling out work to maintain all the shipyards, the costs will be staggering. The

New Attack Submarine crystallizes this debate and offers Congress a rare opportunity to save billions of dollars by beginning this rationalization process. As this process takes place throughout the defense business some decisions will be very difficult. But in this case you have only to let the marketplace work. I firmly believe that Newport News Shipbuilding can save the Country $10 billion over this 30-ship program. All we ask is that we be allowed to compete.

I. NNS CAN FULFILL ALL OF THE NAVY'S SUBMARINE REQUIREMENTS

Mr. Chairman, Newport News Shipbuilding was founded in 1886 and today is widely recognized as the most capable and flexible shipyard in the world. We have built over 700 naval and commercial vessels of all kinds.

More specifically, Newport News Shipbuilding considers itself to be the best submarine builder in the world -- in terms of both cost and quality.

We have been building nuclear-powered submarines for almost 40 years. Today we are a builder of both nuclear-powered submarines and aircraft carriers.

We are the lead design yard for the LOS ANGELES Class and SEAWOLF Class attack submarines, and by the year 2000 every attack submarine in the U.S. Navy fleet will have been designed by Newport News. We have constructed 40% of today's attack submarine fleet. We also have extensive experience overhauling and refueling nuclear submarines.

During the 1980s Newport News Shipbuilding invested almost $300 million in designing and building facilities which can accommodate construction of the world's most advanced submarines. In these facilities we have perfected modular construction techniques at such a fast rate of learning that we have reduced recurring manhours to build a submarine by approximately 40%. We have the capacity to build at least four submarines per year, which is far in excess of any projected build rate.

II. THERE IS NO COMPELLING NEED FOR MAINTAINING TWO NUCLEAR CONSTRUCTION YARDS.

In a report to Secretary of Defense William Perry, dated February 13, 1995, the General Accounting Office stated:

> "Until DOD provides the rationale for its assertions concerning "loss of competition" and the need to protect the "long term defense industrial base and national security," the basis for its decision in the Bottom-Up Review to maintain two nuclear-capable shipyards is not clear."

In April GAO's Richard Davis also testified before the House National Security Committee that:

> "DOD has directed future nuclear submarine work to be done at the other nuclear-capable shipyard, virtually eliminating competition. It is not clear why DOD determined that two nuclear-capable shipyards are needed to protect the long-term defense industrial base and national security."

Our own view is that trying to maintain "two-nuclear capable-shipyards" is both counter productive and very expensive.

First, the concept that having two nuclear shipyards gives the United States added flexibility is incorrect. What will really exist after a short period of years is a single supplier of carriers and a single supplier of submarines, neither of which can produce the other's product in any reasonable time or at any reasonable cost. The true measure of flexibility is whether you can switch from submarines to carriers or back as the world situation dictates. In fact, keeping two nuclear yards will have exactly the opposite effect: creating great inflexibility and high costs as opposed to the flexibility and lower cost that comes from being able, within a single yard, to shift workers from carriers to submarines and vice versa. The reality, as the GAO rightly noted, is that no persuasive case has been made for sustaining two nuclear construction yards.

Second, it should be clearly understood that if Newport News is not allowed to compete fairly for the first flight of New Attack Submarines, we will effectively be eliminated permanently from the submarine business. There has been some talk of preserving Newport News as a "back-up" yard. This idea is illusory. Given that in normal production it takes five years to build these ships (then adding years to restart), it is misleading to talk of us being available as a "surge" option. War situations just won't accommodate seven to eight years for a shipyard to build back up.

Third, the last argument: that redundancy provides crisis protection "in the event of natural disaster" - not only focuses on a very unlikely hypothetical, but appears to assume that bricks and mortar constitute the core of nuclear capable shipyards. This is simply not true. The essence of nuclear shipbuilding is human resources. Without skilled and experienced engineers and craftsmen, nuclear submarines cannot be built. The physical plant of a shipyard ruined by a natural disaster can be repaired far more quickly than a skilled work force lost through attrition can be reconstituted.

In sum, the proposed designation of Electric Boat as the sole producer of nuclear submarines does not "preserve" the industrial base -- it merely determines where that industrial base will be located. In view of the extensive private investment already made at both yards, competition, not unilateral administrative decision, should determine the physical location of the nation's nuclear shipbuilding capacity.

III. CONSOLIDATING ALL NUCLEAR CONSTRUCTION AT NEWPORT NEWS SHIPBUILDING CAN SAVE THE NATION $5-10 BILLION

As we testified before the National Security and Appropriations Committees of the House of Representatives, we believe that the U.S. Government can save $2 billion just by building the first five New Attack Submarines at Newport News Shipbuilding. Furthermore, we have since submitted additional data, at the request of the House Subcommittee Chairman, Representative Duncan Hunter, to Mr. Ronald O'Rourke of the Congressional Research Service (CRS), who is testifying here today. That data showed that the cost savings to the Government, using very conservative assumptions, of consolidating nuclear submarine construction and nuclear aircraft carrier construction at Newport News would be at least $5 billion to $10+ billion dollars between now and the completion of a 30-ship New Attack Submarine program. Mr. O'Rourke is working on his independent analysis of that data, and you will hear him here today. I would also like to point out that when I testified before that House subcommittee almost two months ago, Newport News, Electric Boat, and the Navy were requested to support the CRS so they could obtain an independent view of this debate. Newport News has supplied the data to the CRS on their schedule. It is my understanding that the other parties have not provided the requested data. Why not?

How is Newport News Shipbuilding able to provide up to $10 billion in savings? The answer is that several years ago we embarked on an aggressive business strategy to ensure our viability despite the severe cutbacks in naval ship purchases that were expected throughout the decade of the '90's. This strategy includes three essential parts:

(1) Process re-engineering and organizational restructuring;

(2) High volume production; and

(3) Investment in new technology and facilities.

The strategy was designed to ensure that our ships would be affordable while retaining the quality for which we are renowned. While we recognized that this would be difficult given the expected low rates of production in both aircraft carriers and submarines throughout this period, we saw it as the only way to ensure a viable, vibrant company.

The first and foremost element of our strategy was to achieve the dramatic breakthroughs in process re-engineering and the changes in culture and organization that would ensure we were the low-cost producer in each of our product lines. We called this "operating cost leadership," and it has been the centerpiece of our business strategy since 1991. Since then we have reduced our labor force by over 10,000 and achieved (1) a 35% reduction in manpower (the highest proportion being indirect labor, or white collar support), (2) over a $250 million reduction in annual process costs by meticulously identifying and re-engineering processes; (3) over a 20% reduction in overhead expenses; and (4) a "flattened" organization that eliminated layers of management. We have consolidated plants and facilities, eliminating five off-site engineering offices, two remote plants and several shops within our Newport News complex. We have also reduced our lease costs by more than 50%. We are continuing all of these efforts in our relentless drive to lower our operating costs.

Second, from the beginning we recognized that cost reductions and process re-engineering alone are not enough. The reality is that shipbuilding is a business where there are definite and very substantial economies of scale, and so we had to tackle head-on the issue of whether very low-rate production in any yard, even a totally re-engineered yard, would lead to truly affordable ships. The hard economic facts said no. You must have high volume in shipbuilding. Indeed, I challenge any impartial observer to walk into any nuclear shipyard, view the size and complexity of that business, and then argue that business volume isn't crucial. This realization led to the second part of our strategy, which is to replace lost Navy volume by diversifying into new products and markets, a strategy which we embarked upon in earnest in 1992. Despite the chorus of nay-sayers, we have (1) just completed our 88th commercial ship repair job since 1992, (2) in the area of U.S. Navy surface combatants overhauled the destroyer U.S.S. Hancock and similar work on a sister ship, the U.S.S. Thorn, will be completed by August this year, and (3) successfully penetrated the international commercial market in 1994 with the sale of our new Double Eagle tankers. These were the first commercial ships (two with an option for another two) sold for export by a U.S. firm in nearly 40 years! This news rocked the world shipbuilding industry. Since then, we have signed letters of intent for up to 16 additional tankers, and other customers are lined up. We will be delivering one tanker every three months by the end of 1996.

We have also made tremendous strides in our FF-21 international frigate product line. We are the only U.S. shipbuilder to be short-listed for the United Arab Emirates' impending purchase of new frigates. We have already bested international competition in that country in winning a contract to manage the Abu Dhabi Ship Building Company, and just two months ago, won a competition to overhaul 6 naval vessels for the UAE in that shipyard.

The third and final part of our strategy is the absolute need to continue to improve productivity. The major way to achieve substantial gains in that area is through capital/facilities investment. We are investing in improving our already world-class information technology systems and shipbuilding facilities in order to more completely integrate ship design, planning, scheduling, manufacturing, training, and other ship life-cycle support. We are investing to ensure NNS remains a world leader in the use of process integration, automation and robotics to achieve enhanced productivity. We are investing in an extension to our largest dry dock to simultaneously accommodate both an aircraft carrier and a large commercial ship. We are also investing in a Consolidated Refueling Facility to improve our efficiency for nuclear carrier reactor refuelings and make these projects more affordable for the Navy. Our capital investments amount to $160 million over the next two years, and will pay off many times in enhanced productivity, reduced cycle time and lower per-ship costs.

All these actions position Newport News Shipbuilding to be a low-cost producer of quality nuclear and non-nuclear ships. Competing in global commercial markets demands innovative approaches to improving efficiency and building affordable ships. These efficiencies directly benefit our naval product lines. The investments in facilities, process re-engineering and productivity improvements are paying off in more affordable ships for all our customers, including and especially the U.S. Navy.

We've been executing our strategy for four years, and it is working. If the proof is in the results, then NNS has the evidence of our ability to compete - demonstrated by our international commercial orders.

What does all this have to do with current plans for building the New Attack Submarines? First, we endorse the concept of low-rate production of submarines rather than a complete shutdown. But, the current plan for effectively eliminating Newport News as a supplier of submarines and building them only at Electric Boat at the rate of 1/2 a submarine per year over the next six years is simply not affordable. This plan is flawed by the simple economics of shipbuilding. Decreasing Navy shipbuilding backlogs place tremendous pressure on the abilities of any shipyard to distribute the inherent fixed costs of construction -- both in facilities and people -- without substantial increases in indirect costs per vessel.

Specifically, as I indicated earlier, what we are here to tell you today is that principally by combining nuclear ship construction for both submarines and aircraft carriers at Newport News, the Government will achieve a cost savings of between $5 and $10 billion, even at the projected low-rate production, and even under very extreme future funding assumptions delineated by the Navy.

IV. THE NAVY ADMITS THAT CONSOLIDATING ALL NUCLEAR SHIP CONSTRUCTION AT ONE SHIPYARD IS LESS EXPENSIVE FOR THE GOVERNMENT

Mr. Chairman, the Department of the Navy has just issued its own report, dated May 1, 1995, which defends the Navy's proposed sole-source submarine acquisition plan and criticizes the proposal by Newport News that the New Attack Submarine be competed. This Navy report is essentially advocacy and contains no refutation of detailed, proprietary materials submitted by Newport News to document cost-savings by allowing Newport News to compete fairly for the New Attack Submarine.

Following our initial proposal, Newport News submitted additional information upon request to the House National Security Committee, the General Accounting Office, the Congressional Budget Office (CBO), and the Congressional Research Service. It specifically addressed the Navy's eight high/low ship mix scenarios, and demonstrated that consolidating nuclear shipbuilding work at Newport News will reduce Navy shipbuilding costs by $5 billion to $10 billion over the life of the New Attack Submarine program. For the first five submarines built, the savings will be almost $2 billion.

In its May 1 report, the Navy argues that NNS cost savings, from fiscal year 1995 to fiscal year 2012, will be "only" $1.3 billion in 1996 base year dollars (easily equatable to $2 billion or more in actual out-year dollars) if both nuclear aircraft carrier and nuclear submarine work are consolidated at Newport News.

This savings to American taxpayers is grossly understated and based on unsupportable assumptions -- but the point is made. Newport News will build submarines -- and carriers -- for billions of dollars less. Our defense will be stronger because our precious defense dollars will go farther.

This committee and every Congressional committee is searching for every dollar of savings to balance the federal budget by the year 2002. If billions are wasted to maintain redundant shipbuilding facilities, Congress will have little chance to succeed in maintaining a strong defense while balancing the budget.

Mr. Chairman, Having read and listened to the Navy testimony and their new report, I have written down the logic they have presented. Their reasoning goes as follows:

> First, Electric Boat needs the SSN23 or the cost will go up by $600 million on the first two SEAWOLFS and exceed the Congressional cost cap.
>
> Second, EB must have the NAS or the overhead cost on the SSN23 will go up and cannot be completed for the proposed $1.5 billion in the FY'96 budget.
>
> Third, the NAS needs the SSN23 or Electric Boat's overhead and restart expense will cause the NAS costs to go up by $500 million.

Fourth, if you let Newport News Shipbuilding compete (on a ship that has not been designed and will not be built for three years) it will cost an additional $1 billion, and;

Lastly, if you shut this process down it could cost hundreds of millions of dollars in termination and environmental costs.

If you believe all of this -- you're on a merry-go-round and Congress cannot get off. What I am telling you today is that you can get off and you can control these defense costs -- simply by requiring competition.

V. THE NAVY'S ARGUMENTS AGAINST COMPETITION ARE ESSENTIALLY RHETORIC

Mr. Chairman, I take the strongest possible exception to the Navy's unsupportable assertion that "Electric Boat is the preeminent yard in the United States for nuclear submarine design and construction technology." From every ship and shop where skilled craftsmen assemble at Newport News, the cry goes up: "That's not so!"

The facts are to the contrary. Newport News won 8 out of the last 12 submarines in competition with Electric Boat, and the last two that Electric Boat received (SSN21 and 22) are now hundreds of millions above what Newport News bid. Later Congress had to impose cost caps on Electric Boat's SEAWOLF construction program to control even higher increases.

Newport News was the lead design yard for the Los Angeles class. Newport News was the lead design yard for the SEAWOLF. In fact, no other company but Newport News has designed a nuclear attack submarine in over 30 years. But the Navy now says that there will be no future competitions. Electric Boat will be given a $60 billion sole-source submarine business.

Mr. Chairman, at the specific level, the incorrect and unsupported conclusions in the Navy's study are rampant. I would only note here four major ones, which are:

1. That it would cost roughly $1 billion to shut down Electric Boat and restart NNS. Half of that cost is assumed to be incurred at NNS. To put that in perspective, that is more than the shipbuilder's cost of a current 688 submarine. It simply does not pass the common sense test.

2. After having said that it would cost $500 million to restart submarine work at NNS, the Navy then makes the case that Newport News could compete after 2003. This is totally inconsistent with the first point. Furthermore, we will be permanently out of the business then.

3. That EB's costs will reduce dramatically compared to NNS. This position is not only intuitively false, the fact is that NNS has already taken out great amounts of total cost, while EB has yet to demonstrate that it can stop the ballooning of its per-ship costs.

4. That NNS cost savings are primarily based upon obtaining commercial sales. Our data submitted to the House National Security Subcommittee demonstrates just the opposite--that the overwhelming bulk of the savings comes simply from combining nuclear submarines and nuclear carrier work in one yard.

VI. THE NAVY'S SOLE-SOURCE PROPOSAL IS UNPRECEDENTED, UN-AMERICAN AND UNACCEPTABLE

Mr. Chairman, the private sector has provided the United States with two fully qualified shipyards to design and build nuclear submarines. One shipyard -- Newport News -- has diversified its product line and struggled to protect its work force. The other shipyard -- Electric Boat -- has decided not to diversify, on the theory, apparently, that the Navy would protect it by guaranteeing sole-source submarine work for all time.

With the end of the Cold War, there is submarine work for only one shipyard. Newport News should not be penalized for its very success. Newport News should not be excluded from the competition because it can survive -- as a shipbuilding company -- without contracts for submarine construction. The interests of the taxpayers, not the interests of specialized companies, should be paramount when Congress makes the difficult decision on how to proceed.

Mr. Chairman, Newport News asks only for the chance to compete, in the finest American tradition, for the New Attack Submarine. To do otherwise would be unprecedented, un-American and unacceptable. The refusal of the Navy to compete the New Attack Submarine is of course a major reversal of the Navy's own past policy for the competitive procurement of attack submarines. But, more importantly, to our knowledge the Department of Defense has never used the sole source exception to the Federal Procurement Statutes mandating competition to deny a willing and qualified producer the right to compete and thereby put him out of that product-line business. The award of government contracts, when two fully qualified competitors exist, must be made on the basis of fair competition.

The strength and resilience of the American economy rest upon competitive results, which automatically make rational allocations based upon efficiency and performance. There is no substitute for competition -- not in policy, not in practice, not in result.

Newport News asks only to compete for the right to build New Attack Submarines. After 109 years of service to the country, that is not too much to ask of the Navy. We respectfully request that Congress enact legislation that will ensure fair competition.

VII. THE NAVY CAN EASILY ASSURE THAT NEWPORT NEWS SHIPBUILDING'S SUBMARINE SKILLS ARE PRESERVED UNTIL A 1998 COMPETITION FOR THE NEW ATTACK SUBMARINE.

Under the Navy's plan, nuclear submarine engineering and construction would be shifted exclusively to Electric Boat. This is fundamentally unfair and extraordinarily expensive. Congress should not allow this decision to stand.

The Navy's position that the New Attack Submarine is being designed for construction only at Electric Boat and thus too costly to change to another yard is unsupportable. First, the ship is not yet designed. Detailed design of the ship is not even scheduled for completion until after 1998, when the first submarine is to be built. Second, we estimate the cost to ensure the design can be effectively built at either yard to be negligible. With today's electronic design technologies, such as we already utilized in the SEAWOLF Program, production parameters can be input into the electronic product model at virtually no additional cost.

The design/build team approach outlined by the Navy is a good idea, but it is not new, and the fact of the matter is that most of the improvements can be easily instituted at both yards. We used this concept on the SEAWOLF and continue to use it on current work. The greatest advantage of such teams is to ensure that the designs produced can be efficiently built. Most, if not all, of the significant producibility ideas can be incorporated in the modular construction concept which both yards use. We also reject the Navy's assertion that Electric Boat would do an inferior job on the design if it had to compete. Electric Boat and Newport News have both been the lead design agent for submarines and we have never seen either company not perform in accordance with the highest standards.

IV. Summary

The pending decision on where to build future submarines is a momentous one. If the Navy conducts a competition for New Attack Submarines, the end result will be that the country will save billions of dollars in the cost of building these ships even in the immediate upcoming period where the five-year defense budget shortfall estimates by the General Accounting

Office and Congressional Budget Office range from $50-$110 billion. This is most significant. The decision will ultimately determine if submarines can be an affordable weapon systems and not bankrupt the Navy's SCN accounts in the future. In order to preserve the savings associated with this competition, the Congress should take all steps now to make sure that the competitive positions of all parties are adequately maintained between now and FY'98.

Newport News Shipbuilding urges the Congress to support the procurement of the New Attack Submarine (NAS). But, equally important, we respectfully suggest that the Congress and the Administration carefully consider what we have said about a more affordable way of implementing that procurement decision, and that we be allowed to compete for the business.

I am confident that this Congress and this Committee have the wisdom and the authority to make a sound decision on this issue if given the facts. And, on our side, Newport News Shipbuilding is prepared to live with the results of competition.

Document Separator

CBO TESTIMONY

Statement of
Cindy Williams
Assistant Director
National Security Division
Congressional Budget Office

on
Attack Submarine Programs

before the
Subcommittee on Seapower
Committee on Armed Services
United States Senate

May 16, 1995

NOTICE

This statement is not available for public release until it is delivered at 9:30 a.m. (EDT), Tuesday, May 16, 1995.

CONGRESSIONAL BUDGET OFFICE
SECOND AND D STREETS, S.W.
WASHINGTON, D.C. 20515

Mr. Chairman and Members of the Subcommittee, I am pleased to be here today to discuss issues related to the Administration's plan for producing nuclear attack submarines.

Attack submarine programs are a significant portion of the Navy's overall acquisition plan: in its 1996 request, the Administration has allocated $2.8 billion for them. That sum includes $1,507 million to complete the funding for a third Seawolf submarine, $704 million in advanced procurement funding to support procurement of the first New Attack Submarine (NAS) in 1998, $455 million in research and development funding for the NAS, and $127 million in technology programs supporting the Seawolf program.

My testimony today presents the Congressional Budget Office's (CBO's) preliminary findings from an ongoing study of nuclear-capable shipbuilders, which we have undertaken at the request of Senator McCain. That effort is focused on evaluating the potential long-term advantages and disadvantages, as well as the near-term costs and savings, of consolidating all nuclear shipbuilding in one yard.

Two shipyards currently produce nuclear-powered vessels: General Dynamics' Electric Boat Division, which specializes in submarines, and Tenneco's Newport News Shipbuilding, which builds both submarines and aircraft carriers. The Department of Defense (DoD) has chosen Electric Boat to design and build the first NAS and plans to designate the shipyard to construct more of the ships. It has also chosen to complete a third Seawolf submarine at Electric Boat to ensure that the shipyard continues operating until production of the first NAS begins.

Newport News Shipbuilding has recently petitioned the Congress to mandate that procurement of the NAS be based on "full and open competition." It claims that such a competition would reveal it to be the lower-cost builder. In support of its claim, Newport News has provided an analysis indicating savings of almost $2 billion for the first five ships and $7 billion to $10 billion over the life of the program. The Navy, however, claims that savings would be much less--$1.3 billion through 2012. Furthermore, it asserts that opening up the NAS program for competition at this point would lead to significant delays and, were Newport News to win the competition, the likely prospect that submarine production would be reduced to a single yard.

My testimony today will focus on our preliminary findings in three areas:

- o The need for the third Seawolf submarine that DoD has requested in its fiscal year 1996 budget and the budgetary savings that would result if it was not approved;

- o The risks and potential for savings that would be associated with consolidating all nuclear ship construction in one yard; and

- o The gains and costs from holding a competition or a series of competitions for the New Attack Submarine program.

CANCELING THE SEAWOLF

With the reduced threat from Russian submarines in the post-Cold War world, DoD plans to reduce its force of submarines from 84 in 1995 to between 45 and 55 by the end of the decade and beyond. To reduce the force, the Navy is currently retiring submarines before the end of their service lives. Even with those retirements, the Navy could meet DoD's force goal without producing submarines again until at least 2003. Why does the third Seawolf need to be authorized in 1996? The Navy argues that it supports military requirements and helps maintain the industrial base for producing submarines.

Military Value of the Third Seawolf

In addition to DoD's general force goal of 45 to 55 submarines, the Joint Chiefs of Staff (JCS) have stipulated that by 2012, 10 to 12 of those ships need to be as quiet as the Seawolf--that is, either Seawolf or NAS class vessels. Of course, other attributes, such as the quantity and quality of weapons carried and the quality of a submarine's sensors, combat system, and crew, make important contributions to its overall combat power. But the Navy has always regarded a submarine's level of quietness as an important factor in keeping it hidden from the enemy. A few of the latest Russian attack submarines are quieter at certain speeds than the Navy's existing Los Angeles (688I) class ships, and the Navy argues that it needs submarines that are quieter than the Russian ships. Both the Seawolf and the NAS--equally quiet ships--can fulfill such requirements.

Although the third Seawolf has military value and supports DoD's military requirements, the ship is not critical to fulfill them. Assuming the Navy will achieve a minimum production rate of 1.5 NASs per year beginning in 2002, it will be able to meet both the general force goal of 45 to 55 ships and the JCS requirement for very quiet submarines without buying the third Seawolf.

Effect on the Industrial Base

Although it has argued that the third Seawolf does have military value, DoD has indicated that it needs to build the ship now primarily to shore up the industrial base to produce submarines in the future. The segment of the industrial base helped most from completing the ship is submarine production at the shipyard level. DoD designated Electric Boat to build the third Seawolf to ensure that the shipyard would survive until the NAS is authorized for production in fiscal year 1998.

Apart from its benefits to the prime contractor, completing the third Seawolf submarine does little to help maintain the industrial base for the design of submarines or for the supply of nuclear submarine components. Because the Seawolf class of ships has already been designed, building the third ship no longer requires the skills of numerous design engineers. Electric Boat's designers have already begun working on the design for the NAS. Similarly, because the nuclear reactor for the ship is already being built with advance procurement funds, completing the vessel does little for vendors that produce nuclear components for ships and submarines. Those vendors will benefit more from the authorization of the CVN-76 aircraft carrier last year and the NAS--wherever it is produced--than they will from producing the third Seawolf.

Buying the third Seawolf will support suppliers of certain nonnuclear components, but that may not be necessary. According to a study on the submarine industrial base for DoD conducted by RAND, most vendors supplying nonnuclear components could remain viable suppliers even with a gap of several years in submarine starts.

Savings from Canceling the Third Seawolf

The Navy has requested $1.5 billion in 1996 to complete the third Seawolf. The Congress has already appropriated about $920 million to fund advance procurement of the nuclear reactor, combat system, and other components. (As of March 1995, the Navy had spent $390 million of the $920 million, leaving $530 million unspent.) Those previous appropriations bring the total cost of the ship to about $2.4 billion.

Savings in 1996 from canceling the third Seawolf would be $1.5 billion, an amount that would be offset by potential added costs of $500 million over the next five years (see Table 1). The offsetting costs would include those of shutting down production now, restarting dormant facilities, and retraining the work force when the

TABLE 1. SAVINGS FROM CANCELING THE THIRD SEAWOLF (In billions of dollars)

Total Cost of the Submarine	2.4
Amount Appropriated in Previous Years	-0.9[a]
Amount Requested in 1996	1.5
Reconstitution Expenses	-0.5
CBO Estimate of Net Savings	1.0

SOURCE: Congressional Budget Office based on data from the Department of Defense and RAND.

a. Unspent prior appropriations of $350 million might be used to pay any costs for terminating contracts or expenses for reconstituting production. In its analysis, CBO did not assume that occurred because the funds might be spent before the expenses come due.

NAS is ready to begin production, and the impact on existing contracts. Thus, the net savings from canceling the third Seawolf would be about $1 billion.

Some or all of the $500 million in future offsetting costs and any costs for terminating contracts on the third Seawolf might be paid from the $530 million in unspent appropriations from the previous year. In this analysis, CBO did not assume that occurred, however, because those prior year funds could be spent before such costs come due.

CONSOLIDATING PRODUCTION OF NUCLEAR-POWERED SHIPS AT ONE SHIPYARD

Consolidating the production of nuclear-powered ships at a single shipyard would also be likely to generate long-term savings. Because Newport News Shipbuilding has the facilities to produce both aircraft carriers and submarines, whereas Electric Boat builds only submarines, the only realistic plan for consolidation would be at the former. Newport News has given the Congress its own estimate of such savings from now until the year 2012. That estimate comes to $7.6 billion. The Navy agrees that some savings during that period would occur, but it believes such savings would be only $1.3 billion. (Both estimates include canceling the third Seawolf.) The Navy also argues that the risks of cutting back to a single shipyard outweigh the likely savings.

Long-Term Savings

Consolidating production at Newport News would eliminate excess shipbuilding capacity at Electric Boat, which has no commercial business to help defray the costs to the government of maintaining expensive facilities and certifications to produce nuclear-powered ships. Once consolidation was completed, the Navy would need to support the fixed costs of only one private-sector, nuclear-capable shipyard--the larger Newport News. Given the Navy's planned low rates of construction for submarines and aircraft carriers, those economies of scale are likely to become important.

In addition, Newport News could achieve efficiencies by shifting its workforce between carrier and submarine work. Building military ships to strict government specifications requires a skilled workforce. According to the RAND study on the submarine industrial base, most of the skills required to build a submarine are the same as those needed to produce or overhaul a carrier. Over the longer term, with the low rates of carrier and submarine production, a flexible workforce at one shipyard that could shift between carrier and submarine production might help retain a stable, skilled workforce more effectively and at less cost than separate workforces for carriers and submarines.

Also, if the third Seawolf is canceled and the construction of the NAS is delayed, reconstituting production at Newport News is likely to be less expensive than doing so at Electric Boat. If the ship is canceled in 1996, submarine production would have to be shut down and reconstituted later when NAS production begins. Reconstitution in 1998 would cost about the same at Newport News and Electric Boat, but the larger yard's cost advantage would increase if reconstitution was delayed.

The cost advantage at Newport News would result from its ability to shift its workforce from the CVN-76 aircraft carrier to the NAS. (The RAND study states that the costs of finding, rehiring, and retraining a skilled workforce dwarf all other costs of reconstituting submarine production.) Although current Navy plans call for NAS production to begin in 1998, delays in programs of this size are not uncommon. Exploring and defining the concept for the basic design of the ship took a year longer than planned and thus might affect the schedule for production. In addition, an internal Navy memorandum in the fall of 1994 states that the Chief of Naval Operations was willing to delay production of the NAS to fund programs of higher priority, which might indicate his willingness to do so in the future. Thus, reconstituting submarine production might well be delayed.

Short-Term Costs

Although consolidating construction at Newport News would save money over the long term, it might entail some short-term costs. The Navy and Newport News disagree about the level of those costs. Electric Boat is designing the NAS to be produced in its own facility. The Navy estimates that it would cost about $200 million and take two to four years for Electric Boat to redesign the ship so that it could be produced at Newport News. Alternatively, the president of Newport News claims that such costs would be negligible because the submarine is still in the early stages of design, and modern design tools (computer-aided design systems) make redesign much easier and cheaper. Both shipyards have such tools. In any case, in its final report, CBO will analyze that issue more thoroughly.

Maintaining the Industrial Base

The Navy is concerned that any significant delay in the NAS program could endanger the industrial base for suppliers of submarine components. If redesign caused a significant delay, the Navy might need to take some action to ensure the survival of those vendors. According to RAND, it might keep them in business by funding items before the items were needed, paying them to build prototypes, or using them to revitalize, modernize, or replace equipment on existing submarines. According to the

General Accounting Office, if key vendors went out of business, the cost and time to reconstitute production could be reduced by having the government or the shipbuilder take over production, as Newport News did with torpedo tubes.

Risks of Consolidating Production

The Navy argues that the risks imposed by consolidating to a single nuclear-capable shipyard outweigh the potential cost savings. It maintains that two yards to build submarines are needed to hedge against the possibility of losing a shipyard (for example, from a natural disaster) or to increase rates of production if a Russian submarine threat increases dramatically. If a second yard--Electric Boat--was needed and had already closed, the Navy argues that it would be difficult and time-consuming to get it recertified to build nuclear-powered ships.

Not least, the Navy is reluctant to lose Electric Boat because it regards it as the preeminent yard in the United States for nuclear submarine design and construction technology. In particular, it notes that the shipyard designed the nuclear propulsion plants of 18 of the last 19 classes of submarines and provides design, engineering, production, and fleet support for the Seawolf and the Trident ballistic missile submarine programs.

But, in fact, only one yard--Newport News--produces nuclear-powered aircraft carriers. Therefore, the Navy has no extra capacity to build carriers in the event of a natural disaster or even a nuclear mishap. That situation existed even during the Cold War when the threat was greater. Arguably, with the decline of the threat from Russian submarines in the post Cold-War world, producing submarines might be less critical than producing carriers, given the shift in U.S. naval strategy to projecting power ashore in coastal areas and the need for weapon systems that provide maximum capability in those areas. Therefore, one shipyard capable of producing carriers and submarines might now be sufficient.

More important, Newport News has a maximum capacity to build at least four submarines per year. In the long term, assuming that the average expected life of a submarine is 30 years, the capacity to build four submarines a year could support a steady-state force of 120 attack submarines--a fleet exceeding that of the later Cold War years (a maximum of about 100 ships). Thus, the capacity to build four submarines a year would meet most plausible scenarios postulating a resurgent submarine threat.

Finally, although Electric Boat designed the power plants for 18 of the last 19 classes of submarines, Newport News designed the power plant of the modern Los Angeles (688) class submarine that is still in production. If Electric Boat's design capability is a major reason the Navy continues to operate the shipyard, perhaps a more economical solution is to retain that function and close the production facilities.

CONSOLIDATION VERSUS COMPETITION

According to the Navy, another risk of consolidating production at one shipyard is that it might eliminate the possibility of future competition to build submarines. Currently, however, no competition exists to build submarines because the Navy plans to allocate the design and production to Electric Boat for the foreseeable future. The Navy maintains that its plan to allocate production of the third Seawolf and the design and production of at least the first NAS vessels to Electric Boat was necessary. By way of explanation, it claims that building submarines at an average rate below two per year initially would not sustain competition between two shipyards. But sometime after the turn of the century, the Navy hopes to increase production to two ships per year; it argues that a competition might then be held. The potential for future competition, it contends, ensures leverage over Electric Boat to keep the cost of the ships down in the interim.

Newport News maintains, however, that if the Navy continues to designate Electric Boat to build submarines while it builds none, its capacity to produce them will erode. Therefore, in the future, the Navy would continue to incur the fixed costs of two nuclear-capable shipyards--one capable of producing carriers and one capable of producing submarines--without reaping the cost savings of having two potential suppliers of submarines. Thus, the Navy's current plan might leave it without the possibility of generating competition in the future and the leverage to hold costs down in the interim.

Furthermore, prospects for competitive procurement of submarines either now or in the future are questionable. First, the Navy may never produce submarines at two per year. Even though the NAS is being advertised as a low-cost successor to the Seawolf, the first ship of the class is projected to cost $3.3 billion to procure. That price is about $900 million more than the third Seawolf, which costs about $2.4 billion. Although the cost of the lead ship in any class is greater than follow-on vessels, and the Navy eventually hopes to get the unit cost down to $1.5 billion, it may have difficulty closing such a wide gap. If the Navy cannot reduce unit costs substantially, it may not be able to afford to produce two ships per year.

Second, according to an analysis by the Congressional Research Service (CRS), even if two submarines a year are produced, sustaining competition between the two shipyards may not be realistic. For fiscal years 1994 and 1995, the Navy decided that a production rate of three ships a year would not sustain competition between the two shipyards producing DDG-51 destroyers without risking their financial health. Therefore, prospects would be limited for competition for submarines at an even lower rate of production.

The CRS analysis also notes that even if competition for submarines could be sustained, the Navy might not necessarily save money. The inefficiencies from splitting the production learning curve between the two shipyards might more than offset the savings from competition. The analysis suggests that to avoid the added expenses of dividing a small purchase of submarines between two shipyards, a winner-take-all competition for multiple ships or the entire NAS purchase could be held. In that instance, a one-time competition, rather than government industrial policy, would decide whether one or two nuclear-capable shipyards remained. In question is whether a shipyard would bid extremely low to win the contract and then raise the price after the losing shipyard left the submarine production business. Also, would the long-term savings from a winner-take-all competition exceed any short-term costs to the government to "level the playing field" between the two shipyards? CBO's ongoing study will analyze that issue quantitatively.

The CRS analysis lists some of the actions that might be needed to make competition more equitable. The Navy might have to fund a Seawolf or some other new submarine construction project in 1996 at Newport News as well as Electric Boat to ensure that Electric Boat did not enjoy an advantage. (Newport News maintains, however, that it could resume submarine production in 1998 if it was given some submarine overhauls and repair work now performed by the Navy's shipyards.) The analysis suggests that if no new construction project was funded at Newport News, the shipyard's reconstitution costs might have to be considered during the bidding.

In addition, because Electric Boat is designing the NAS to be produced at its facility, the analysis notes that Newport News would have to be allowed to observe or participate in the design process and that the design would have to be modified to permit Newport News to produce it. As noted earlier, the Navy estimates that altering the design would cost about $200 million and delay the NAS program by two to four years. However, Newport News argues that the extra costs and time are negligible.

In short, with competition, the possibility exists that the Navy could spend substantial amounts of money to level the playing field. Whether long-term savings from competition would exceed those amounts is unknown. Also, of course, if the competition was winner-take-all and Newport News won, the Navy would end up with only one shipyard that could produce nuclear-powered ships anyway.

REALLOCATING WORK FROM THE PUBLIC SHIPYARDS

If consolidating production at one shipyard--either by an industrial policy or as a result of competition--was thought to be too risky, both shipyards could be kept open with work reallocated from the four public shipyards that are nuclear capable. Reallocating some submarine overhauls from public to private shipyards would allow the private yards to spread overhead among more contracts, help keep their skilled workforces more efficiently employed, and eliminate excess naval industrial capacity as some of the public yards were reduced or closed.

CONCLUSIONS

Canceling construction of the third Seawolf submarine and consolidating the production of all nuclear-powered ships at Newport News would almost surely generate both near-term and long-term budgetary savings. Canceling the third Seawolf would save about $1.5 billion in 1996, reduced by $500 million in future expenses. The third Seawolf is not needed to meet overall goals for the attack submarine force: the Navy is reducing the number of attack submarines from 84 in 1995 to its force goal of between 45 and 55. Although the Seawolf is an excellent submarine in many respects--it can carry considerably more weapons than a Los Angeles class submarine and achieves new standards in quietness--DoD leaders have already determined that it is too expensive to buy in quantity. They initiated the NAS program to develop a submarine that is equally quiet, but smaller and cheaper to produce. By 2012, enough of those new submarines will be built to meet the JCS's goal of 10 to 12 very quiet submarines without adding a third Seawolf.

As for consolidating production of nuclear-powered ships in a single shipyard, it would very likely generate long-term savings. However, the amount of savings is in dispute. Newport News estimates that consolidating all construction of nuclear ships at its shipyard would save the government $7.6 billion between now and 2012. The Navy estimates savings at $1.3 billion over that period. (Both estimates assume a third Seawolf is not built.) CBO has not completed its own estimate, but it will probably fall between those two amounts.

The limited number of purchases of nuclear-powered vessels in the Navy's current plan makes consolidation an attractive option from an economic standpoint. Current Navy plans call for producing one aircraft carrier every four years, starting in 2002, after a seven-year gap from the CVN-76 authorized in 1995. Over that same period, the Navy would build the NAS at a rate of no more than two submarines a year. At those low rates of production, paying the overhead costs associated with two separate shipyards is not very economical. A single, larger shipyard would have the advantage of shifting workers between carrier and submarine production as needed.

Allowing both shipyards to continue to compete for submarine contracts appears to be problematic, as long as the Navy plans to acquire the NAS at no more than two a year. Keeping both yards open and active to support a yearly competition might be more expensive than buying submarines from a single yard: it would require the Navy to pay the overhead on two sets of underused facilities and to incur costs to level the playing field between the competitors to ensure a fair competition.

As an alternative strategy, the Navy might be able to conduct a winner-take-all competition for multiple ships or even for the entire NAS program. If won by Newport News, such a competition would have the same effect as directing consolidation. If won by Electric Boat, it could lead to the same result as the Administration's current plan, but with the attendant delays and additional costs associated with mounting a fair and open competition. CBO will address the issue of the potential gains and costs of competition more thoroughly when it issues its study.

Document Separator

NOT FOR PUBLICATION UNTIL RELEASED BY THE
SENATE ARMED SERVICES COMMITTEE
SEAPOWER SUBCOMMITTEE

STATEMENT OF

THE HONORABLE NORA SLATKIN
ASSISTANT SECRETARY OF THE NAVY
(RESEARCH, DEVELOPMENT AND ACQUISITION)

AND

ADMIRAL BRUCE DEMARS, USN
DIRECTOR, NAVAL NUCLEAR PROPULSION

AND

VICE ADMIRAL T. JOSEPH LOPEZ, USN
DEPUTY CHIEF OF NAVAL OPERATIONS
RESOURCES, WARFARE REQUIREMENTS AND ASSESSMENTS

BEFORE THE

SUBCOMMITTEE ON SEAPOWER

OF THE

SENATE ARMED SERVICES COMMITTEE

ON

FY 1996 NAVY SUBMARINE MODERNIZATION PLAN

MAY 16, 1995

NOT FOR PUBLICATION UNTIL RELEASED BY THE
SENATE ARMED SERVICES COMMITTEE
SEAPOWER SUBCOMMITTEE

THE HONORABLE NORA SLATKIN
Assistant Secretary of the Navy
Research, Development & Acquisition

As the Assistant Secretary of the Navy for Research, Development and Acquisition, Nora Slatkin is the Department's Acquisition Executive responsible for all research, development and procurement of defense systems satisfying the requirements of the Navy and Marine Corps. She is also responsible for all acquisition policy and procedures within the Department.

Prior to being nominated and confirmed as the Assistant Secretary of the Navy she was assigned as Special Assistant to the Under Secretary of Defense for Acquisition. In this capacity she was involved in defense acquisition program oversight and policy development on a Department of Defense wide basis.

From December 1984 to January 1993 she was a member of the professional staff of the House Armed Services Committee where she served as the lead staff member of the Subcommittees on Procurement and Military Nuclear Systems.

For seven years prior to joining the professional staff of the House Armed Services Committee Ms. Slatkin was the principal defense analyst with the Congressional Budget Office for ground force issues. In addition she has worked as a graduate fellow at the National Security Council, the Department of State and the Central Intelligence Agency.

Ms. Slatkin is a Phi Beta Kappa graduate of Lehigh University (1977) with a degree in International Relations and holds a Master of Science degree in Foreign Service from Georgetown University (1979). She has also attended the Harvard University Program for Senior Executives in National and International Security (1990).

Ms. Slatkin was born in Glen Cove, New York on May 5, 1955. She and her husband, Deral Willis, reside in Annapolis, Maryland.

ADMIRAL BRUCE DeMARS
Director, Naval Nuclear Propulsion

Admiral Bruce DeMars, of Chicago, Illinois, graduated from the United States Naval Academy in 1957. Following commissioning he served in the attack transports USS TELFAIR and USS OKANOGAN and, after Submarine School, the diesel-electric submarine USS CAPITAINE. Following nuclear power training he served in the nuclear-powered submarines USS GEORGE WASHINGTON, USS SNOOK, and USS STURGEON before reporting for duty as Commanding Officer of USS CAVALLA.

Shore duty tours included instructor duty at Nuclear Power School and Submarine School and attendance at the Armed Forces Staff College. Following staff duty with Submarine Squadron TEN, he served as Senior Member of the Nuclear Propulsion Examining Board, U. S. Atlantic Fleet. He commanded Submarine Development Squadron TWELVE in New London, Connecticut. He then served as Deputy Director, Attack Submarine Division in the Office of the Chief of Naval Operations until selected for promotion to Rear Admiral in 1981.

As a flag officer, he served as Commander, U.S. Naval Forces Marianas/Commander, U.S. Naval Base Guam, Commander in Chief, Pacific Representative for Guam and the Trust Territory of the Pacific Islands; and as Assistant Deputy Chief and the Deputy Chief of Naval Operations for Submarine Warfare. He was appointed Director, Naval Nuclear Propulsion Program, Department of the Navy/Department of Energy in October 1988.

Admiral DeMars is married to the former Margaret Ann Milburn of Chicago, Illinois. They have two children, Bruce and Margaret.

Vice Admiral T. Joseph Lopez

Deputy Chief of Naval Operations
(Resources, Warfare Requirements and Assessments)

Vice Admiral Lopez was born in Powellton, West Virginia January 20, 1940. He entered the U.S. Navy in September 1959 and was commissioned in December 1964. His education includes a Bachelor of Arts (cum laude) in International Relations and a master of Science in Personnel Management. After commissioning, he served aboard USS EUGENE A. GREENE (DD 711) and USS WALLACE L. LIND (DD 703) and attended the U.S. Naval Destroyer School. In 1969 he was assigned as Commanding Officer of River Division ONE FIVE THREE in Vietnam, where one of his tasks was commanding a joint U.S. and Vietnamese naval assault into Cambodia in May 1970.

Vice Admiral Lopez completed his education at the Naval Postgraduate School from August 1970 through June 1973, was ordered to the Armed Forces Staff College, and began a two year tour as Flag Secretary for Commander Cruiser Destroyer Group EIGHT in 1974. In October 1977, he was reassigned as Executive Officer of USS TRUETT (FF 1095) followed by duty at the Naval Military Personnel Command as the Cruiser-Destroyer Atlantic Placement Officer in March 1979. Vice Admiral Lopez was subsequently assigned in June 1980 as the Special Assistant for Navy Personnel to the Assistant Secretary of the Navy (Manpower, Reserve Affairs, and Logistics). He assumed command of USS STUMP (DD 978) in September 1982, completing a Persian Gulf deployment in 1983. He was assigned in November 1984 as Special Assistant to the Chief of Naval Personnel.

Vice Admiral Lopez commanded Destroyer Squadron THIRTY-TWO from February 1987 through March 1988. In 1988 he served as Executive Assistant to the Chief of Naval Personnel/Deputy Chief of Naval Operations and in August 1988 was assigned as the Executive Assistant to the Vice Chief of Naval Operations. Vice Admiral Lopez served from July 1989 through July 1990 as Deputy Director for Current Operations in the Office of the Joint Chiefs of Staff and as the Senior Military Assistant to the Secretary of Defense from August 1990 to June 1992. He was promoted to Vice Admiral in July 1992. Vice Admiral Lopez commanded the United States Sixth Fleet and NATO's Striking and Support Forces Southern Europe from July 1992 to December 1993. He assumed duties as Deputy Chief of Naval Operations (Resources, Warfare Requirements & Assessments) in December 1993.

Vice Admiral Lopez wears the Defense Distinguished Service Medal, the Navy Distinguished Service Medal, three Legions of Merit, the Bronze Star (with Combat "V"), two Meritorious Service Medals, two Navy Commendations Medals (with Combat "V"), Navy Achievement Medal (with Combat "V"), Combat Action Ribbon, Presidential Unit Citation and numerous other unit and campaign awards.

Vice Admiral Lopez is married to the former Vivian Hall of Longacre, West Virginia. They have a son, Tom, and a daughter, Dominique.

Mr. Chairman, distinguished members of the Subcommittee, thank you for this opportunity to appear before you to discuss the Department of the Navy's Submarine Program and Fiscal Year 1996 budget request.

In my testimony today I will make three main points:

First, the changes brought by the end of the Cold War mean significant changes for our attack submarine program. We must maintain undersea superiority, but we are putting new emphasis on a variety of missions to deal with the demands of this new era.

Second, we have the right platform for the future with our smaller, more affordable but very capable New Attack Submarine. The application of technology to reduce cost, and the emphasis on flexibility and modularity to adapt to new missions mark a significant change in focus from our past Cold War priorities.

Third, we face a near-term decision on a production bridge to move us from where we are today to where we need to be to begin production of our New Attack Submarine. We have thoroughly examined this issue in studies within the department and without. Our analysis shows us that one solution gives us both the best return on our money and allows us to best prepare for the future. That solution is using construction of the SSN 23 as the production bridge to the New Attack Submarine.

To support these points in detail, Mr. Chairman, I have divided my testimony into three main parts. First our mission requirements; second, our New Attack Submarine program, and third, the important near-term decisions for submarine recapitalization.

I. THREAT AND MISSION REQUIREMENTS

Why Submarines?

Before discussing the specifics of the submarine recapitalization and modernization plan it is worthwhile to review the value of submarines. Why do we need them? What do they do?

Their most enduring characteristic is STEALTH. As in any form of warfare, the ability to remain undetected or camouflaged from the enemy is of prime importance. Today, and perhaps more so in the future, submarine STEALTH will translate into two major warfare enhancements.

- The submarine can perform its peacetime forward deployed missions in a non-provocative fashion, thereby minimizing confrontation and diplomatic escalation.

- The submarine can perform these missions in the midst of anticipated threats without a defensive network for self-protection.

The SSN operates without a "logistics tail" -- routinely remaining at sea without re-supply for months at a time. It is constantly ready to perform all of its multiple missions and is capable of performing several simultaneously. With the advantages realized from nuclear propulsion it responds instantly to tasking.

Submarines are usually the first naval platform to arrive on station and can remain there unsupported. This presence provides full spectrum tactical intelligence collection and provides on the scene indication and warning of an adversary's actions. Armed exclusively with an offensive payload, they provide firepower for land attack and sea control.

The Need for Superior Submarines

Clearly, the need for dominance in submarine warfare did not end with the Cold War: Russian technological advances continue to challenge our superiority. And with the global proliferation of diesel submarines the need for quality submarines remains great. Countering this worldwide threat is justification alone to warrant continued dependence on this weapon platform. But there are even more compelling needs:

- As long as other nations maintain the ability to launch ballistic missiles from submarines, we will need attack submarines -- they are our primary, and sometimes only, conventional means of holding this threat at bay.

- Our attack submarines provide critical national intelligence and surveillance information. The fact that a submarine can collect this information while "invisible" to the regional aggressor is another indicator of their strategic importance to the nation.

- The same cases can be made for the unique contributions submarines bring to regional conflicts and strategic deterrence, as well as, the enabling role they play for joint forces as they covertly prepare the littoral battlespace for the entry of follow-on forces.

Russian Submarines

The entire Russian military has been affected by dire economic conditions. However, within the Russian Navy the submarine force has been far less affected than the surface force. Their submarine research, development and construction programs remain aggressive. We cannot afford to lose sight of this reality as we concentrate on regional conflicts and third world capabilities. We, as a maritime nation, should remain committed to not ceding undersea superiority to any other power.

Out of area Russian submarine activity is lower than Cold War levels. However, a recent demonstration of Russian submarine potential occurred in July 1994. An OSCAR anti-ship missile submarine left its home waters and intercepted two US Carrier Battle Groups operating in the Western Pacific. This episode reflects a Russian desire to maintain a world class submarine force. The ultimate future of the force will depend on economic recovery, the Russian Navy's claims on defense resources, and the out come of the Russian debate over the future of the nuclear triad.

As other nations develop submarine expertise, incidents such as this are likely to occur. Nations with nuclear submarines are capable of interdicting shipping on the open seas while those with conventional submarines can deny freedom of navigation through geographic choke points and transit lanes in proximity to their shores.

Russian Submarine Quality Improves

Russia has placed a national priority on quality submarine forces - both attack and ballistic missile - retaining a formidable force of over 180 capable nuclear and diesel submarines today and projected to be building toward a quality force of 20 ballistic missile submarines, 60 nuclear attack submarines (including 14 SSGNs) and 40 diesel submarines by early in the next decade.

With increasing dependence on the submarine force for executing their nuclear missile strategy, the Russian commitment to develop the most advanced technologies in their submarines continues unabated. Their national resolve to field highly capable attack submarines hinges on this national policy. The Russians frequently deploy their SSNs as protective assets for their SSBN force and as such they recognize that these assets must be equal if not better than U.S. submarines.

With the introduction of the Improved AKULA submarine, the Russians have seized the lead in submarine acoustic quieting. Later units of the AKULA Class submarine have been backfitted with advanced quieting equipment. These hulls are quieter, at some speeds, than our best 688Is. Additionally, submarines with equivalent or better quieting are in construction. They will retain the status of having the quietest submarines in the world until the SSN-21 is delivered in 1996 and becomes operational around 1998.

Threat Proliferation to Littoral Nations

The concern is not limited to Russian submarines. The Chinese submarine force is the third largest in the world and includes six nuclear powered submarines. Of particular concern to our Navy is the increased proliferation of advanced weapons systems, especially diesel submarines and mines to other countries. Third world countries can produce diesel submarines or procure them from Russia or Western Europe. Mines are also widely available on the world market.

At present there are more than 40 countries that maintain and operate diesel submarines. Although the combined inventory of over 350 submarines includes many antiquated submarines, there are approximately 25 modern diesel submarines in construction throughout the world today. Some of these non-nuclear submarines are available for procurement on the open market. This is a challenge to our anti-submarine forces. In addition to quality platforms, weapons systems, sensors and processing power are available to countries intent on shifting the balance of regional power. Our continued investment in submarine modernization is the most prudent counter to these threats.

New Threat Environment

The warfare challenge that drives the need for submarines extends beyond the submarine threat. Missiles and mines are among the top warfighting concerns of our naval leadership as they look to the future. The value of the submarine in this hostile environment can not be overstated. The submarine role takes on greater importance as littoral nations strive to procure the warfighting equipment that could deny surface access to adjacent waters. Submarines operating in or near these waters provide the Task Force Commander with a non-obtrusive asset that prepares the battlespace and responds with force when required. This unique warfighting asset prepares the battlespace to enable the flow of follow-on forces.

Force Levels and the Need to Restart Production NOW

The Department of Defense position is to maintain a force level of 45-55 attack submarines. The Joint Chiefs of Staff have mandated that 10-12 submarines have SEAWOLF-like stealth by the year 2012.

No U.S. submarine has been authorized for construction since 1991.

This creates a challenge of maintaining the required force level in a era of rapidly declining budget resources with an unprecedented gaps in the construction of nuclear attack submarines.

We need to achieve a continuous and efficient submarine production rate by 2002 in order to sustain the required SSN force levels. Starting in 2011 our remaining 688s will reach the end of their service life at a rate of 2 to 4 per year. Given the time span to construct a submarine coupled with the fact that future build rates will be at a low rate of production -- we must begin building the new class of submarine as soon as we can -- 1998. Reaching low rate production by the turn of the century will satisfy vital military requirements and sustain our ability to build submarines - affordably.

II. NEW ATTACK SUBMARINE

Why a New Class of Submarines?

Two distinct streams of thought converged to establish the requirement for a new submarine design:

- o First, the anticipated demise of the Russian Navy called into question the need for SEAWOLF class submarines. The SSN-21 was perceived to possess excess military capability in light of the projected post-Cold War security environment. The Navy revised its submarine recapitalization efforts toward developing a lower cost alternative for SEAWOLF. Simply stated, the Navy needs a submarine that can be built in adequate numbers to sustain submarine force levels well into the next century. "Surplus Capability" had to be traded for cost.

- o Second, the dominant threat over the past four decades has been the Soviet Union. That threat concentrated submarine performance toward only two of the many missions performed by SSNs. Accordingly, submarine design efforts were also dominated by Anti-Submarine warfare and Anti-Ship Warfare mission requirements. Although other missions were exercised during the Cold War, special enhancements and technology applications were not optimized in submarine designs. Today, the threat has expanded beyond the Russian Navy to a more diverse set of dangers that include theater ballistic missiles, cruise missiles, diesel submarines and mines that are now being proliferated throughout the littoral nations of the world. Realizing that SSNs will play a prominent role in this new security environment, the Navy acknowledged the need for a new submarine, specifically tailored for the changing mission and threat.

The confluence of these two streams of thought led to the development of the New Attack Submarine -- a submarine that will provide the Navy with the required military capability -- for less cost -- and fully address the multi-mission diversity required in the post-Cold War environment.

Design/Build Approach

The New Attack Submarine is using a design/build approach as the cornerstone for affordability. We have established a partnership with the Groton, CT builder much earlier in the ship design process than on previous submarine programs. This was possible because decisions taken earlier determined that the lead New Attack Submarine would be designed and built at Groton. This early partnering meant that the design could be truly optimized to the builder's method of ship construction. There was an early establishment of integrated teams from the Navy, key component suppliers, designers and shipbuilders to drive costs down by making prudent, early decisions on ship design before less efficient approaches were locked in.

New Attack Submarine -- Right for the Future

The New Attack Submarine design incorporates needed improvements on core characteristics that make submarines dominant in multiple warfare scenarios. It also reflects a dedicated effort by the Navy to preserve or enhance the submarine's performance in most mission areas.

The design is innovative by being able to insert new technologies as they develop and accommodate new equipment. Integral to this entire process is the unprecedented demand for controlling procurement and life cycle costs. The need for greater military capability and flexibility must be satisfied at the lowest possible cost.

New Attack Submarine -- Littoral Warfare Performance

The New Attack Submarine is the first nuclear submarine designed to focus on the spectrum of missions rather than emphasizing Cold War priorities. For operations in potentially mined and shallow waters, the new submarine will incorporate a system that reduces its magnetic signature. Its mast arrangement and torpedo room will be reconfigurable so that they can be altered to conform to specific missions. Incorporating a fiber optic "periscope", called a Photonics Mast, provides improved night vision, enhanced image recognition, improved threat recognition and a laser range finder. It will also be constructed with a Special Forces exit and entry chamber. It will be capable of carrying underwater vehicles designed to deliver Navy Seals or Marine Recon Forces.

An "open systems" commercialized electronics architecture, facilitating the use of Commercial Off the Shelf Systems, ensures that New Attack Submarine will remain in step with the electronics revolution. While remaining the "silent service", this submarine will be connected with all Naval and Joint communications networks.

Lastly, engineering developments in the propulsion plant contribute to the New Attack Submarine's total mission performance. Stealth is the enabling capability that allows the submarine:

- to maintain tactical advantage
- to enjoy unimpeded access to critical waters
- to avoid confrontation when appropriate
- to covertly observe the adversary

New Attack Submarine and Affordability

In addition to the military requirements that drove the design of the New Attack Submarine, affordability has been a major focus since the work began. Once the military requirements were established and validated, affordable production and life cycle support assumed center stage.

Major cost reductions have been realized through producibility initiatives such as simplification, the use of more commercial items and integrating the efforts of design and build teams.

This New Attack Submarine, with all its enhanced capabilities, will cost far less than producing SEAWOLF in a similar economic and production environment. In fact, the cost will be comparable to the Los Angeles Class Submarine in today's market.

New Attack Submarine and Flexibility

Efforts have been made to ensure that the New Attack Submarine will remain the right submarine far into the next century. It has been designed for flexibility. It affordably incorporates future technologies when they become available. One of the enabling features for unprecedented capability is Modular Isolated Deck Structure (MIDS). MIDS isolates deck mounted equipment from radiating noise into the water and protects the same equipment from violent external shock. Because MIDS satisfies a large portion of the noise and shock specifications, commercial equipment including electronics can be used more than ever before. The need for MILSPEC equipment is reduced. Since more commercial components are used, this platform will be able to affordably maintain "state of the art" technology throughout its lifetime.

After twenty years of production and sixty-two ships, the Los Angeles Class Submarines have expended their room for growth, due to weight constraints. The MIDS concept will help mitigate this problem from occurring on the New Attack Submarine.

The Navy and DoD have confirmed independently that best state-of-the-art technology has been incorporated into the New Attack Submarine; there are no new technologies in sight; and when new technologies become available, New Attack Submarine will share in their use and do so in an affordable manner.

The Navy's integrated submarine recapitalization plan sustains a critical national asset ensuring that we maintain future readiness and maritime supremacy. The plan to build the SSN 23 in fiscal year 1996, continue New Attack Submarine design efforts and start lead ship construction in fiscal 1998 is fully funded in the FYDP. The second New Attack Submarine (fiscal year 2000) is also fully funded in the Future Years Defense Plan.

III. THE REQUIREMENT FOR A BRIDGE SUBMARINE

We have made a commitment to the New Attack Submarine as the submarine for the next century, but we have a problem.

The problem is an unprecedented gap in the history of the construction of attack submarines. There have been no new construction starts since 1991. We are clearly in a transition period from high rate to low rate production. We need a method to "bridge" this gap. There are six key elements to be considered in any bridge solution:

1. Design of complex, vendor-supplied non-nuclear components,

2. Production of complex, vendor-supplied non-nuclear components,

3. Design of nuclear components,

4. Production of nuclear components,

5. Design of nuclear submarines,

6. Construction of nuclear submarines.

The issue was examined in a number of ways, including studies by the Navy, the Joint Staff and the Office of the Secretary of Defense, as well as an independent examination of the issues by the RAND Corporation.

The conclusions drawn by all of these studies are essentially the same, i.e. additional SSN construction is essential to "bridging" submarine production from 1991 (last nuclear submarine new construction authorization) to the planned authorization of the New Attack Submarine in 1998. The gap, without SSN construction, would have a devastating impact on an industry which, of necessity, is dedicated to design and construction of nuclear submarine components and has little or no offsetting, parallel commercial work.

Construction of the SSN 23 at the Groton builder was determined to be the most time- and cost-efficient solution. This decision was taken only after a thorough examination of alternatives and provides clear benefits for the Navy and the nation.

Alternatives for Bridging the Gap

1. Shutdown of the Industrial Base until 1998 or later

Nuclear capable shipbuilders represent a collection of skills that are difficult to establish but quick to perish. We have never attempted a shutdown and restart of a nuclear capable shipyard. It would be safe to say that such an exercise would be of very high risk and there is no guarantee that we would ever be able to recover the capability. Additionally, the impact of any protracted gap is felt at the component supplier level as well. The gap may well force some of the vendor base to leave the industry. These vendors would have to be replaced before submarine production could be restarted with associated cost and schedule impacts. This would be a particularly acute problem for specialized component manufacturers.

The loss of a nuclear capable shipyard precludes the ability to rapidly ramp up production at a later date. Recertification of a shut down builder would be a long process and would require immediate restart and high SSN build rate (3-4 per year) to sustain the required force levels.

Finally, this option provides none of the key ingredients needed to permit construction of the New Attack Submarine, i.e. design and construction skills.

2. Bridging the gap with selected submarine components

This option delivers no capability for the investment made. It is a make work type of scenario that provides no support for the ship design, integration nor construction process.

3. Bridging the gap with overhaul/new construction of SSN 688I Class submarines

Overhaul of SSN 688Is

Submarine overhauls do not require the same type or magnitude of design effort associated with new submarine development. Similarly, overhauls do not require and, therefore, do not preserve the mix of skills demanded by new submarine construction. Further, overhauls provide little work for component suppliers. Without new construction, suppliers will go out of business. The talent, skills and discipline to design, build, test and integrate these components will be lost. Reconstituting would be time-consuming and costly, assuming it could be done at all. The overhaul/upgrade approach postpones inevitable block obsolescence.

Continued construction of SSN 688Is

Construction of a single SSN 688I in FY 96 may not be achievable by industry due to the short preparation time and does not provide enough workload or require the right mix of skills to maintain this critical core of personnel. It would take two SSN 688Is to provide the necessary workload to maintain baseline construction skills.

Further, as the Navy shifted to SSN 21 design and production in the late 1980s, SSN 688I suppliers began shutting down production of SSN 688I material and components and retooled to support SSN 21 production. Retooling and restarting SSN 688I production to support one or two ships, would be expensive and inefficient, as would reinvesting in some of the older technologies which have been overtaken by SEAWOLF technologies.

Construction of SSN 23

Construction of SSN 23 provides the most cost-effective solution to sustaining the nuclear submarine design and construction capability. This approach has the near term added benefit of providing the nation with a third state-of-the-art SEAWOLF submarine.

The authorization of SSN 23 takes advantage of the $900 million of SSN23 specific long lead materials previously authorized.

Authorization of SSN 23 and low rate production of New Attack Submarines, beginning with the lead ship in 1998, provides the necessary workload to maintain critical construction and design skills through this decade. Other alternatives considered simply do not possess the workload nor require the right mix of skills to adequately bridge the gap.

Why SSN 23?

The case for SSN 23 as a bridge submarine is compelling from the perspective of its value added in terms or warfighting capability, its preservation of key industrial base components and the sense it makes from an economic perspective when compared to other alternatives.

The SEAWOLF class submarine not only addresses all current warfighting needs, but introduces capabilities and technologies that are lacking in today's forces. With its superior speed and payload, the SEAWOLF is ideally suited to deliver a rapid and decisive military response. The acoustic quieting achieved in this ship will preserve U.S. dominance of the undersea battlespace that has been increasingly challenged by the advanced, high quality submarines still being built by the former Soviet Union. Acknowledging this threat, the Joint Staff has called for 10-12 submarines of SEAWOLF level quieting by 2012. In addition to quieting, SEAWOLF provides a reduced magnetic signature, making it less susceptible to mines and shallow water detection, improved electronics surveillance capabilities and the next generation sonar suite; all of which contribute to the missions assigned today and expected tomorrow. SEAWOLF can do every mission better than 688I.

Building the third SEAWOLF also represents a responsible fiscal decision. Prior to terminating the SEAWOLF class and during the subsequent period of program restructuring, approximately $380 million of SEAWOLF class components were purchased. Additionally, $540 million directed by Congress for "SSN 23 or some other project to preserve the industrial base" has been responsibly directed toward the acquisition of SSN 23 components. As a result of this prudent allocation of resources, the remaining cost to build SSN 23 is about $1.5 billion. This is approximately two-thirds of the total cost, and comparable to the cost of building a new 688I.

Thus the decision to complete the SSN 23 represents an exceptional one-time financial opportunity to buy a warship second to none at about the same cost required to build a new 688I. Further, the "to go cost" of $1.5 billion also preserves a vital national resource and maintains market stability serving as a cost control mechanism for future production.

SSN 23 construction not only makes sense from a military value and cost standpoint but has also been proven through repeated, independent, studies to be the most cost effective method for retaining the skills required to build quality submarines.

Among the alternatives considered, SSN 23 has been identified as the only feasible bridge to the 1998 start of the New Attack Submarine. The submarine industrial base is comprised of three major skill and labor elements: those involved with shipbuilding, the non-nuclear submarine unique vendors and the nuclear vendors. While New Attack Submarine development/advanced procurement will support critical design and nuclear production skills, the SSN 23 is the only project available between now and 1998 that preserves the production skills of the shipbuilder and non-nuclear submarine unique vendors. All other options considered include too much risk in maintaining or rebuilding these unique skills and facilities. The production activity over the next decade has been stretched to the breaking point. Any further disruption or alteration of the planned build profile could irreparably jeopardize industry's ability to deliver needed submarines in the future. It is imperative that we build SSN 23 in 1996.

In summary, the decision to build SSN 23 is prudent because it provides unequaled military capability through its superior stealth, speed and payload, it takes advantage of funds already appropriated procuring the ship at a cost comparable with an 688I class today, and it preserves the nation's ability to build "high tech" submarines -- providing stability during industry restructuring and transition to stable low rate production.

Cost Impact of Not Building SSN 23

The remaining investment to deliver SSN 23 is $1.5 billion. Completing the SSN 23 is part of the overall Navy plan to bridge to the New Attack Submarine at the Groton, CT shipyard with lead ship construction commencing in 1998.

Detouring from completing SSN 23 would cost the Government roughly $700 million to $1.0 billion plus potential intangible costs that could be hundreds of millions of dollars. These cost are increased costs to the current SEAWOLF and TRIDENT programs as well as the New Attack Submarine program. They are all unbudgeted costs.

The rough estimate of Government liability in each area (in then year $) is:

Existing contracts	$205M - $360M
New Attack Submarine	$510M - $670M
Potential Other costs	Unknown (potentially 100s of $millions)

o **Existing Contracts**. Because there have been no submarine starts since 1991, shipbuilder workload is dramatically declining. Without SSN 23, overhead/indirect cost allocations would increase for the shipbuilder's remaining contracts. Specifically:

-- The overhead rates, estimates at completion and budgets relating to all the shipbuilder's existing contracts presume SSN 23 will absorb a substantial share of the shipbuilder's overhead. Deletion of SSN 23 would cause overhead, to be allocated (via higher overhead rates) among remaining contracts. Moreover, additional indirect costs such as construction facility/equipment lay-up costs and unallocated material cost would be charged to existing contracts.

-- Higher overhead rates also would result in increased costs to Navy on its engineering and design contracts, which are cost type contracts for which Navy pays all allowable and allocable costs. These contracts represent about half the work to be performed by the shipbuilder for the rest of the decade.

o **New Attack Submarine**. Deletion of SSN 23 would cause overhead, which otherwise would be borne by SSN 23 in fiscal years 1998 - 2002, to be allocated to the New Attack Submarine (via a higher overhead rate). More importantly, without SSN 23 in fiscal year 1996, the Navy would lose -- and then try to reconstitute -- critical capabilities essential to constructing the New Attack Submarine in fiscal year 1998, e.g., skilled tradesmen, unique construction facilities, and key submarine component suppliers. The New Attack Submarine would bear the cost of restarting or sustaining these capabilities.

Tomorrow's Readiness -- Production Activity Snapshot

During the 1980s the Navy was authorized to build thirty-eight submarines. So far, in the 1990s the number is four. As the number of submarines under construction declined from twenty-four in 1991 to two in 1996, the submarine industrial base embarked on a tremendous restructuring program.

Steady production of one to two submarines per year represents the most efficient production rate for this restructured industry. This rate safeguards the Navy's future capability to build quality submarines and provides the necessary force structure as 688 class ships reach their end of service life. The earliest start for the new SSN is 1998, with stable production achieved shortly thereafter. Industry needs a bridge to 1998. Numerous studies conducted by the Joint Staff, OSD, Navy and other independent agencies show that constructing a third SEAWOLF is the most economical and lowest risk option for bridging this gap.

Certain components are unique to submarines making the submarine force the only market for them. Manufacturing these components requires an extremely skilled work force and expensive facilities. All are costly to maintain. Private industry may not support retaining this capacity unless there is a promise of continued opportunities. Committing to a low rate of production is essential toward gaining the necessary support among the unique vendors and builders of submarines.

The knowledge and skills required for submarine design and construction are unique and perishable. Without exercising these skills through the actual practice of submarine shipbuilding, they will rapidly erode. Reestablishing proficiency is a difficult and time consuming process.

Examples of the time needed to fully establish proficiency in the key trades associated with the building of a modern nuclear powered submarine include:

- 3 years: Sheetmetal and Carpenters
- 5 years: Shipfitters, Welders, Electricians, and Pipefitters
- 6 years: Machinists
- 9 years: Testers

The exacting standards we enforce during the construction of these vessels require these times to attain proficiency.

For this reason, numerous submarine studies conducted over the past several years stress the importance of avoiding a production gap. Once these skills are interrupted, a series of delays are introduced that could ultimately impact our ability as a nation to build and afford these submarines.

This is true not only with production skills, but also in the area of submarine design. It takes ten to fifteen years to develop a design engineer. The training includes a period of formal education, followed by an apprenticeship program that includes over five years of hand-on experience. These engineers represent a very scarce and valuable commodity -- one that is best kept intact through a continuous design effort.

The other submarine program options will require some amount of reconstitution of these critical skills, resulting in higher risk and near term costs. The Navy plan is the only approach that minimizes a design or production gap.

The Need for Two Nuclear Capable Shipbuilders

The Bottom Up Review arrived at the national policy decision to maintain two nuclear capable shipyards. Two nuclear capable shipyards is a fundamental response to uncertain future threats in that it provides the decision maker the ability to ramp up submarine production if and when required.

Two nuclear capable shipbuilders also provide the following benefits:

o Provides greater stability to the nuclear shipbuilding industry in terms of a business base,

o Allows for the introduction of competition at a future date if it is advantageous to the government. The fact that competition is retained as a future possibility creates appropriate pressures to contain current costs.

- o Crisis protection in the event of a natural disaster.

Any potential downsizing to a single yard must also be evaluated in terms of the capabilities we lose. Those include:

- o TRIDENT/SEAWOLF design, engineering, production and fleet support expertise,
- o Nuclear power plant design capabilities

The Impact of Competition

The Navy's current plan -- SSN 23 in fiscal year 1996 and continuation of the New Attack Submarine Design/Build process at Groton, CT -- **preserves two nuclear capable shipbuilders and permits competition to be introduced when it is advantageous to the government.**

Simply put, potential competition in the New Attack Submarine program is an issue of timing. **In order to adequately sustain competition there must be a sufficiently** [redacted] **Attack Submarine program does not achieve this level of build rate until fiscal year 2002** and beyond. There is also the question of when we will build the next carrier.

Introducing competition now is not in the best interest of the government based on the following:

- o It would reduce the benefits of the design/build approach.
- o Near term construction activity is insufficient to sustain two production yards
- o It would force a downsizing to a single nuclear capable shipbuilder if Groton, CT were to lose the competition,
- o It would require both yards to participate in the current New Attack Submarine design process with undesirable results including: increased design costs, no benefit form SEAWOLF lessons learned, i.e. forces split design production effort, breaks down existing partnerships with suppliers and limits benefits from the current design/build process.
- o It would extend the construction period of the New Attack Submarine lead ship.

Introducing competition in the future may be more advantageous because:

- o It allows completion of New Attack Submarine design and supports an orderly transition to stable low rate production,
- o It avoids inefficiencies during the tenuous transition period
- o [redacted]

A competitive scenario before stable production rates are achieved adds an estimated $650 million to $1.1 billion to cost and extends the lead ship construction period, does not support force level requirements and, in fact, we may still wind up with two nuclear capable shipyards at higher costs.

Assessment of Navy Plan vice Shipbuilder Proposed Alternative Plan

The Navy recently completed an assessment of the Navy's plan vice an alternative proposal by Newport News. This proposal calls for competition for constructing the lead New Attack Submarine. A copy of our report is provided as an attachment to this statement.

Newport News claims they would win a competition for the New Attack Submarine and save the Navy $2 billion over the first five hulls.

Although our review showed that the Newport News plan would realize some savings, it would significantly jeopardize the Navy's ability to efficiently accomplish nuclear warship design and construction. ~~To put this issue in perspective,~~ [redacted] Nevertheless, the benefit of maintaining two nuclear shipbuilders is clearly worth the additional cost.

The cost of maintaining nuclear capable shipbuilders is summarized below:

SHIPBUILDER COST (FY 1995 - FY 2012)
(Cost to Navy for 24 SSNs, 4 CVNs and 4 CVN Refuelings in FY 1996 $Billion)

	SSNs	CVNs/Other	Total
Two Nuclear Shipbuilders (SSN 23 and 23 New Attack Submarines at Electric Boat, CVNs at Newport News)	$19.5	$20.7	$40.2
One Nuclear Shipbuilder (24 New Attack Submarines and CVNs at Newport News)	$18.7	$20.2	$38.9

Conclusions

In summary, nuclear attack submarines will continue to be vital to the nation's security. The nuclear attack submarine's multi-mission versatility and stealth will strengthen its role in the next century. Its ability to rapidly respond to crisis situations, remain on station almost indefinitely, and provide a variety of response options are irreplaceable and increasingly important in the new security environment.

SSN 23 provides the nation with unequaled military capability and sustains the industrial base.

Our future New Attack Submarine provides the best balance between cost and capability.

Strong commitment to stable low rate production is key to preserving our nation's ability to produce advanced nuclear submarines. We must protect this crucial national asset that has been decades in the making, and allow the SSNs we build to be both capable and affordable.

REPORT ON

NAVY SUBMARINE ACQUISITION PLAN

AND

ASSESSMENT OF SHIPBUILDER PROPOSED ALTERNATIVE PLAN

1 MAY 1995

PREPARED FOR
THE ASSISTANT SECRETARY OF THE NAVY
(RESEARCH, DEVELOPMENT, AND ACQUISITION)

Admiral B. DeMars
Director, Naval Nuclear Propulsion

Vice Admiral G. R. Sterner
Commander, Naval Sea Systems Command

Rear Admiral R. E. Frick
Program Executive Officer for Submarines

NAVY SUBMARINE ACQUISITION PLAN
AND ASSESSMENT OF SHIPBUILDER PROPOSED ALTERNATIVE PLAN
EXECUTIVE SUMMARY

- **The submarine funding decisions now before Congress are pivotal** to the survival of our nuclear submarine industrial capability and to maintaining our margin of undersea superiority.

- **The Navy's plan -- building a final SEAWOLF in FY 96 and New Attack Submarines beginning in FY 98 at Electric Boat Division -- is the lowest cost way,** with acceptable risk, to sustain the industrial base and shift to affordable, capable attack submarines. The plan, consistent with DoD's strategy, preserves leverage and hedges against uncertainty by maintaining two nuclear capable shipbuilders -- the Groton shipbuilder with submarines and Newport News Shipbuilding with aircraft carriers.

- **Newport News proposed an alternative plan: competition for constructing the lead New Attack Submarine.** Newport News claims they would win the competition and save the Navy $2 billion for the first five New Attack Submarines.

- **The Newport News plan would realize no significant savings, but would jeopardize the Navy's ability to efficiently manage nuclear warship design and construction.** Specifically:

  - **The cost premium for maintaining two nuclear capable shipbuilders per the Navy's plan is relatively small -- about 3%** of the cost of the Navy's total Electric Boat/Newport News workload when based on realistic assumptions about future workload and costs at the two shipbuilders. Newport News does not factor in Electric Boat overhead reductions and efficiency improvements and therefore greatly overstates the cost differential (direct and indirect) between the two yards. Electric Boat shutdown and Newport News start-up costs ($650M to $1100M total) are key factors that Newport News underestimates.

  - **The Navy (if Electric Boat shuts down) would lose invaluable leverage and the hedge against uncertainty that come with having two nuclear capable shipbuilders.** Having the option of a second yard provides continuing leverage to keep costs down even without direct competition -- and preserves the option of competition in the future once the build rate is high enough to support building at two yards.

  - **Electric Boat is the preeminent yard in the U.S. for nuclear submarine design and construction technology; the Navy would lose this expertise should all attack submarine construction shift to Newport News.** This expertise is crucial given our narrowing margin of submarine superiority.

  - **Competing the lead ship would create major program management problems** and undermine the cost savings potential of the innovative New Attack Submarine design/build process.

<u>Conclusion</u>: **Proceed with the Navy plan.** The Navy plan will minimize submarine construction costs and risk over time and produce affordable nuclear warships from an industrial base capable (as best as possible) of accommodating future uncertainty.

INTRODUCTION

The submarine funding decisions before Congress are pivotal. The Nation's submarine building capability is at a crucial point. By 1998, the shipbuilders will have delivered all U.S. submarines now under construction. Survival of our nuclear shipbuilding capability and reactor components industrial base is in jeopardy -- along with the future of affordable nuclear warships. Moreover, our margin of undersea superiority is the slimmest since the 1950s; for the first time, another nation has quieter submarines at sea. To meet this challenge, the Navy has a plan well underway.

THE NAVY's PLAN AND UNDERLYING DOD STRATEGY

<u>Navy Attack Submarine Acquisition Plan -- the Lowest Cost Approach with Acceptable Level of Risk</u>. The final SEAWOLF submarine (SSN 23) is budgeted in 1996. Already more than one-third funded, SSN 23 is the lowest cost attack submarine the Nation can build now. SSN 23 supports the Joint Chiefs of Staff military requirement for submarine quieting and is key to maintaining the mix of skills and suppliers needed to initiate building a class of more affordable "New Attack Submarines" starting in 1998. The New Attack Submarine design builds on important SEAWOLF technological advances. Through innovative design concepts and a procurement plan that closely integrates the work of designers, builders, and suppliers, the cost of a New Attack Submarine will be close to that of a new LOS ANGELES Class attack submarine. This plan is the lowest cost way, with acceptable risk, to sustain the industrial base for submarines and nuclear components and enable transition to a more affordable attack submarine fleet capable of meeting the threat. The Navy's plan implements the DoD strategy for acquisition of nuclear powered warships.

<u>DoD Nuclear Warship Acquisition Strategy Provides Invaluable Leverage and a Hedge Against Uncertainty</u>. This strategy maintains two nuclear capable shipbuilders -- Electric Boat Division with submarines -- and Newport News Shipbuilding with aircraft carriers. The Navy is well into implementing this strategy. To reduce overhead and ship costs, Electric Boat is continuing to re-engineer organizations and processes. This effort, coupled with the high aircraft carrier construction and overhaul workload the Navy is directing to Newport News, helps both companies survive while providing ships at reasonable cost. The strategy provides both a hedge against an uncertain future and invaluable leverage that come with having the option to compete. Moreover, keeping two nuclear capable shipbuilders is consistent with other defense industrial strategies; e.g., the U.S. has five major conventional surface shipbuilders and six military aircraft suppliers.

ASSESSMENT OF SHIPBUILDER PROPOSED ALTERNATIVE PLAN

Alternative Acquisition Plan Would Compete Lead New Attack Submarine. Newport News recently proposed an alternative plan to the Navy and Congress, namely competition for constructing the lead New Attack Submarine -- together with the Navy providing submarine overhaul and design work to Newport News to "level the playing field". Newport News indicated that if allowed to bid, they would win the competition and could save the Navy $2 billion for the first five New Attack Submarines -- and an additional $4.5 billion if Newport News were to build subsequent New Attack Submarines to complete the class. Based on Newport News' assertion, the cognizant Congressional subcommittees are seeking to understand what, if any, cost premium there is for the DoD policy of maintaining two nuclear capable shipbuilders and whether it would be best for the Government to compete the New Attack Submarine.

Assessment of Alternative Plan: Provides no significant savings, but jeopardizes the Navy's ability to efficiently manage nuclear warship design and construction. Specifically:

• **The cost premium for maintaining two nuclear capable builders per the Navy's submarine acquisition plan is about 3 percent** -- when based on realistic assumptions about future workload and costs at the two shipbuilders, as shown in the following table:

SHIPBUILDER COST (FY 1995 - FY 2012)
(Cost to Navy for 24 SSNs*, 4 CVNs and 4 CVN Refuelings)

FY96 $Billion

	SSNs	CVNs/Other	Total
Two Nuclear Shipbuilders (Submarines at Electric Boat, CVNs at Newport News)	$19.5	$20.7	$40.2
One Nuclear Shipbuilder (SSNs and CVNs at Newport News)	$18.7	$20.2	$38.9

* SSN 23 and New Attack Submarines at Electric Boat; all New Attack Submarines at Newport News.

COST PREMIUM: THREE PERCENT.

Attachment A provides details on the above analysis, including the cost estimating methodology. Moreover, Attachment A shows clearly that the savings Newport News predicts would not be forthcoming because Newport News:

- underestimates their overhead rates by assuming unrealistically high levels of commercial, foreign frigate, and Navy repair work;

- is not knowledgeable of (or does not acknowledge) Electric Boat overhead reductions and efficiency improvements achieved through corporate "re-engineering";

- greatly overstates the cost differential (direct and indirect) between the two yards;

- overlooks the bulk of the substantial cost to shut down submarine production at Electric Boat and start up at Newport News.

- does not include the extra cost and consequences to the Navy of providing Newport News the submarine engineering, design, and overhaul work Newport News states is necessary to avoid submarine start-up costs.

- does not factor in the relative efficiency of a one-product yard vice a multi-product yard; and

- assumes a higher learning rate than Electric Boat.

• **The Navy (if Electric Boat shuts down) would lose invaluable leverage and the hedge against uncertainty that come with having two nuclear capable shipbuilders.** Having two nuclear capable shipbuilders provides the Navy continuing leverage to keep costs down (even without direct competition), preserves the option for competition over the long term, enables faster increase in building rates if necessary in the future, and hedges against loss or problems at one of the shipbuilders. The Navy should retain these crucial advantages, especially since the cost of doing so is relatively small (about 3%).

• **Competition for initial New Attack Submarines could preclude the possibility of future competition** once higher building rates are required. Only two New Attack Submarines are planned in the FYDP -- too low a rate to sustain submarine construction at two yards. Newport News could under-bid during the competition given the substantial advantage they have as a result of the Navy's recent sole source contract award to Newport News for construction of CVN 76. Electric Boat then could go out of business, foreclosing the option of competition for submarines in the future. With the Navy's plan, once the build rate is high enough to support construction at two yards, a familiarization contract could be placed with Newport News to enable them to compete for construction of a mature, validated design.

• **The Navy would lose Electric Boat's preeminent nuclear submarine design expertise if all submarine construction shifts to Newport News.** Electric Boat provides engineering, planning and logistical support for all classes of submarines:

- Electric Boat designed and built the lead ship of all but two of the 16 U.S. nuclear submarine classes preceding the SSN 688. Because of difficulties inherent in trying to resolve issues with a sole source contractor (Electric Boat), the Navy assigned the SSN 688 Class design contract to Newport News to obtain the leverage and flexibility that come with having an alternate submarine source. For

SEAWOLF, the Navy assigned the work for the ship's front end to Newport News to set up competition for the lead ship construction for a class then expected to include about 30 ships (at a rate of 3 and in some cases 4 per year); Electric Boat already had been selected to design the propulsion plant.

- Electric Boat designed all but one of the Navy's submarine propulsion plant designs, the first Vertical Launch System (VLS), the Wide Aperture Array (WAA), etc.

- Electric Boat developed modular construction for nuclear submarines and led its evolution to the third generation.

Unlike Newport News, which has built ships of many types, Electric Boat always has been a submarine designer/builder. Retaining Electric Boat's expertise is crucial given our narrowing margin of submarine superiority. (See Attachment B for details.)

- **Competing the lead ship would create major program management problems.** In particular, competition would:

  - **Impair the New Attack Submarine design/build process by hindering the open communications between the Navy and the ship design yard essential for the process to work.** The ship design yard would be reluctant to divulge cost saving construction innovations for fear of undermining its competitive position.

  - **Undermine shipbuilder responsibility.** A "fair" competition requires equal terms and conditions. Since Newport News can't be held responsible for the New Attack Submarine design, Electric Boat would have to be relieved of design responsibility as the single design/build contractor. [redacted]

  - **Impede the design process.** If Newport News were to win, either the design would have to be transferred to Newport News or some of the problems experienced by the SEAWOLF program's split design and building yards could recur (e.g., inefficiencies caused by different design philosophies, computerized design systems, part numbers, etc.). If the design operation were transferred to Newport News, the process would be costly, long term, and tumultuous -- placing an increasing burden on the Navy's in-house design and engineering resources in an era when privatization is being encouraged Government-wide.

The current Navy plan for awarding a design/build contract to Electric Boat would avoid the above problems. (See Attachment C for further explanation.)

CONCLUSION

The Navy is executing a well thought-out plan to produce affordable nuclear warships and, as best as possible, maintain an industrial base which will accommodate future uncertainty.

The Navy's plan is to shift to low rate attack submarine production through authorization of SSN 23 in FY 96 and the lead New Attack Submarine in FY 98 with Electric Boat as the designer/builder (see Attachment D for more detail). The Navy's plan will:

- minimize submarine construction costs and risk over time;
- sustain the industrial base for submarines and nuclear components;
- preserve invaluable leverage that comes with having the option of competition; and
- enable transition to an affordable, capable, and flexible attack submarine fleet.

Attachments:

A Cost Premium for Having Two Nuclear Capable Shipbuilders and Analysis of Shipbuilder Proposed Alternative Plan

B Electric Boat, Preeminent Shipyard for Nuclear Submarine Design and Construction Technology

C Programmatic Issues Related to Competing the Lead New Attack Submarine

D Navy Submarine Acquisition Plan

ATTACHMENT A
COST PREMIUM FOR HAVING TWO NUCLEAR CAPABLE SHIPBUILDERS AND ANALYSIS OF A SHIPBUILDER'S PROPOSED ALTERNATIVE PLAN

This attachment provides the results of the Navy's analysis of three key issues:

- the cost of maintaining two vice one nuclear-capable shipbuilders;

- the cost of not building SSN 23 and shifting construction of the New Attack Submarine to Newport News Shipbuilding; and

- the March 1995 Newport News alternative plan for future submarine construction as provided to the DoD and Navy -- assumed to be the same plan provided to the House National Security Committee.

THE COST OF MAINTAINING TWO NUCLEAR-CAPABLE SHIPBUILDERS

The Navy's plan for submarine and carrier construction and carrier refueling overhauls maintains two nuclear-capable shipbuilders.

The Navy has never taken the position that the two-yard strategy for building attack submarines is less expensive than a one-yard strategy. However, detailed analysis shows the total, shipyard-wide Navy cost premium for maintaining two nuclear-capable ship builders is relatively small (about 3%) under realistic workload assumptions.

Moreover, the advantages of maintaining two yards for the long term far outweigh the estimated cost. Specifically, having two nuclear capable shipbuilders:

- preserves the option for submarine competition when building rates increase in the future;

- provides continuing leverage to keep costs down -- even without direct competition;

- enables faster increase in building rate if necessary in the future;

- hedges against loss or problems at one of the builders; and

- is consistent with other defense industrial strategies -- the U.S. has five major conventional surface shipbuilding yards and six military aircraft suppliers.

Any analysis of the cost of maintaining two shipyards must examine short-term and long-term costs and take into account the total cost to the Government for work done at Electric Boat and Newport News. The analysis must include attack submarine and carrier construction, carrier refueling, overhaul and repair work and other surface ship construction. In addition, variations in Newport News projected workload must also be analyzed. An analysis focused on just one aspect of the Navy's workload such as attack submarine construction will likely have skewed results.

The Navy examined four alternatives. All alternatives build the same number of attack submarines over the period FY 1996 through FY 2012. Alternative 1, the baseline case, maintains two nuclear capable shipbuilders and assumes a realistic level of Navy and commercial work. Alternative 2 shifts all nuclear shipbuilding to Newport News and assumes a realistic level of Navy and commercial work.

Shipbuilder Cost FY 1995-FY 2012
(24 SSNs, 4 CVNs and 4 CVN refuelings)

FY96 $Billion

	SSNs	CVNs/Other	Total
Alternative 1 -- Two Shipbuilders (SSNs at Electric Boat, CVNs at Newport News)	$19.5	$20.7	$40.2
Alternative 2 -- One Shipbuilder (Realistic workload)	$18.7	$20.2	$38.9

Alternatives 3 and 4 are provided to demonstrate the cost sensitivity of workload variances at Newport News -- alternative 3 assumes Newport News' highly optimistic projections of commercial work and alternative 4 assumes a low level of both Navy and commercial work.

Shipbuilder Cost FY 1995-FY 2012
(24 SSNs, 4 CVNs and 4 CVN refuelings)

FY96 $Billion

	SSNs	CVNs/Other	Total
Alternative 3 -- One Shipbuilder (High workload)	$18.3	$20.1	$38.4
Alternative 4 -- One Shipbuilder (Low workload)	$18.9	$20.5	$39.4

Details on the cost estimating methodology for the above analysis are shown on the last page of this attachment.

COST OF NOT BUILDING SSN 23 AND SHIFTING ATTACK SUBMARINE CONSTRUCTION TO NEWPORT NEWS

- **Impact to non SSN 23 Budget Authority: $650M to $1100M (TY $)**

- **Electric Boat Costs**

  Loss of a Nuclear Shipyard: $440M - $610M

  $180M (RAND estimate) to $350M (Electric Boat estimate) for Electric Boat shutdown
  - Retiree benefits (excluding fully funded pension), undepreciated assets, ongoing facility cost until plant closure complete

  ~$260M Shutdown impacts on existing work
  - Reallocation of fixed costs, which would have been borne by SSN23, to existing contracts, plus additional inefficiencies for yard closeout
  - Remaining liability to ceiling on shipbuilding contracts
  - SEAWOLF Cost Cap not achievable
  - Recovery of business exit costs would become a higher priority to Electric Boat than its present cost minimization goal

- **Environment Cleanup**

  $ Unknown Environmental cleanup cost greatest unknown -- responsibility would be contentious
  - Could outweigh any plausible ship cost comparisons

- **Newport News Costs: $210M - $490M**

  $ 30 - $ 65M Adding a new project creates work force and management problems which impacts CVN construction
  - Single product focus in a shipyard yields greatest efficiency
  - Since July '92, CVN estimates at completion have improved up to 5% during period with no submarine authorizations -- similar effects seen at other yards

  $180 - $235M Impact of Design Transfer
  - Must duplicate sunk design efforts
  - Nontransferable efforts at Electric Boat

  $ 0 - $190M Impact on Lead Ship Construction
  - Submarine facility restart costs -- no attack submarine award in 8 years
  - Submarine work force retraining
  - Delay in delivery
  - Replace lost suppliers and capability for material and equipment
  - Supplier reallocation of fixed costs, otherwise borne by SSN 23
  - Newport News projected lower labor costs

ASSESSMENT OF NEWPORT NEWS SHIPBUILDING ALTERNATIVE PLAN

The Newport News Shipbuilding March 1995 analysis claims the following cost savings:

- $1.9B if the first five New Attack Submarines are awarded to Newport News and SSN 23 is built by Electric Boat. Additionally, savings are alleged to increase to $3.6B if SSN 23 is not awarded.

Newport News cost estimating methodology is as follows:

- To estimate the cost of building five New Attack Submarines at Newport News vice Electric Boat, Newport News uses a detailed cost estimating model to develop manning and overhead cost projections.

- [redacted] foreign frigates, LPD new construction, [redacted] and an additional carrier (CVN 77). This results in Newport News workload levels which are near record highs. (Without this highly optimistic workload, Newport News' claimed savings are not possible.)

- [redacted]

The Newport News analysis does not account for a number of factors and issues which greatly change the cost impact to the Navy. For example Newport News:

- Does not recognize the improved efficiency at Electric Boat expected to result from the design/build process. The potential loss of the Electric Boat design/build effort to date has a direct impact on the affordability of the New Attack Submarine. Newport News assumes they can build the lead New Attack Submarine for less than Electric Boat. However, due to the substantial up front design and planning work inherent in the design/build process, Electric Boat should be able to build the lead ship for less.

- Overlooks the extra costs and risk of converting Electric Boat's design products to Newport News production systems. A portion of the design completed to date would require re-work.

- Assumes extremely optimistic future workload levels, including a large amount of commercial work. This high workload is key to the Newport News savings projection. However, commercial construction usually requires Government subsidies or loan guarantees, the cost of which are not included in the Newport News analysis.

- Does not include the extra cost and consequences of providing the submarine engineering, design and overhaul work which Newport News states is necessary to avoid submarine construction start-up costs. Neither Newport News start-up costs nor the extra cost and disruption involved in removing scheduled submarine repair work from Naval shipyards is addressed in Newport News' analysis.

- Does not acknowledge the restructuring, reorganizing and downsizing Electric Boat is actively engaged in to reduce future overhead costs. As a result, the Newport News projections of Electric Boat's overhead are overstated. Through FY 95, Electric Boat re-engineering has saved the U.S. Government over $100M, with estimated FYDP savings of over $500M.

- Overlooks the cost the Navy would incur if Electric Boat were to shutdown.

The Newport News analysis does not appear to include expected construction efficiency improvement at Electric Boat.
The Navy expects Electric Boat to improve future submarine construction efficiency because: Electric Boat will have a higher ratio of high skilled workers after downsizing; and Electric Boat is working to establish a multi-skilled worker environment at Groton, similar to that at Electric Boat's Quonset Point facility.

Newport News assumes a significant savings to other work under contract. However, the cost of existing work would go down primarily because Newport News' fixed overhead would be allocated over additional New Attack Submarine work. The Government would still pay for all of the overhead.

COST ESTIMATING METHODOLOGY:

SHIPBUILDER COST

- The total cost of the ship, less Government Furnished Equipment.

SHIPBUILDING CONTRACT

- LABOR HOURS

- New Attack Submarine labor hours are based on first ship cost relationships at the subsystem level derived predominantly from SEAWOLF returns. Shipbuilder-specific adjustments for make/buy differentials between the shipyards are based on late 1980s SSN 688I class comparisons. Follow ship estimates are based on historical submarine non-recurring costs and projected learning curves. Carrier labor hours are based on recent CVN returns.

- Shipbuilder specific learning curves are applied to both Newport News and Electric Boat New Attack Submarine labor estimates. New Attack Submarine learning curves at Electric Boat are based on the OHIO Class (SSBN 726) program, adjusted for the design/build process, which possesses many of the single shipyard and design related construction efficiencies embodied by design/build. Newport News learning curves are based on actual SSN 688 learning curves at Newport News.

- Multi-product inefficiencies are estimated where appropriate. As demonstrated by analysis of major US shipbuilders over the past decade, increases in labor hours per ship typically occur when a shipyard, dedicated to single product line, diverts core resources to manage additional product lines. This increases labor hours for multi-product scenarios.

- DIRECT LABOR RATES

- Direct labor rate projections are based on the latest shipyard-specific union wage rate agreements. Outyear projections are inflated via OSD/OMB SCN inflation indices.

- OVERHEAD

- Overhead projections are based on yard-specific trend analysis and projections of outyear operating budgets. Navy modeling of Newport News projections were found to be consistent with recent CVN 76 contract negotiations. Navy estimation of Electric Boat overhead rates is based on monitoring Electric Boat re-engineering efforts, via quarterly SSN 21 Cost Performance Report analysis and periodic interviews of Electric Boat financial control officials. Electric Boat has met their right-sizing goals to date. Far term projections are highly dependent on workload assumptions.

- MATERIAL

- Submarine material is based on first ship cost relationships at the subsystem level derived predominantly from SEAWOLF returns. Shipbuilder-specific adjustments for make/buy differentials are based on late 1980s SSN 688I class comparisons. Follow ships are based on historical submarine nonrecurring costs and learning curves. Equal adjustments are made for both shipbuilders regarding New Attack Submarine long lead material and affordability initiatives on all ships. Carrier material is based on CVN return data.

- PROFIT

- For two nuclear shipyard scenarios, the New Attack Submarine profit percentage is estimated consistent with the Ohio class. The Ohio class most accurately reflects the postulated competitive situation of the New Attack Submarine program.

- For sole source, single nuclear shipyard scenarios, a fee consistent with that of the CVN 76 award was used.

- FACILITIES COST OF MONEY

- Facilities Cost of Money (FCM) is calculated by multiplying the net book value of land and depreciable assets in a firm by a representative loan rate calculated by the US Treasury Department in accordance with Public Law 92-41. This provides the annual imputed cost of money for a defense firm which is allocated across contracts. For shipbuilders with relatively small amounts of depreciable assets, such as Electric Boat, FCM is estimated as less than $10M per submarine contract. For shipyards with substantially robust capital investment programs such as Newport News, FCM is estimated at $30-50M for submarines and $90-100M for CVN contracts.

- PLANS

- The design cost for lead ships represents the SCN portion of shipyard design and drawings. Follow ships cover follow-on engineering services. The same cost is assumed regardless of shipbuilder.

- CHANGE ORDERS

- A change order allowance of 10% for lead ships and 5% for follow ships, as applied to Basic Construction, is used in all scenarios.

- ESCALATION

- Shipbuilder contracts are "base dated" to a specific month and year. Escalation is the reimbursement of inflation over the life of the contract from the contract's base date, and is dependent on overall shipbuilder cost.

ATTACHMENT B
ELECTRIC BOAT -- PREEMINENT SHIPYARD
FOR NUCLEAR SUBMARINE DESIGN AND CONSTRUCTION TECHNOLOGY

Electric Boat is the nation's preeminent submarine designer. Electric Boat, by virtue of its experience and innovation, is the premier resource for submarine design and construction technology in the U.S. Electric Boat designs, builds, and supports submarines for the U.S. Navy. Electric Boat's inherent strength derives in great measure from its concentration on one product, for one customer.

• **Electric Boat is the dominant influence in development of U.S. nuclear powered submarines**:

- **Electric Boat designed the first nuclear submarine,** NAUTILUS, and the first strategic missile submarine, GEORGE WASHINGTON. Electric Boat designed the nuclear propulsion plant in every submarine class, except one, and designed every U.S. strategic missile submarine. Electric Boat pioneered the modular construction process more than 20 years ago, and is now designing the third generation improvement of this process for the New Attack Submarine.

- **Of the 19 nuclear submarine classes developed, Electric Boat designed 15** and shares design responsibility for one other. Electric Boat designed and built the lead ship of all but two of the 16 nuclear submarine classes preceding the SSN 688. (The other two classes were designed and built by Naval shipyards.) Because of difficulties inherent in trying to resolve issues with Electric Boat as a sole source contractor, the Navy assigned the SSN 688 design contract to Newport News to obtain the leverage and flexibility that comes with having an alternate submarine source. For SEAWOLF, the Navy assigned the work for the ship's front end to Newport News to set up competition for the lead ship construction for a class then expected to include nearly 30 ships at 3 to 4 ships a year; Electric Boat already had been selected to design the propulsion plant. Whereas Newport News is a surface ship builder that can build submarines, Electric Boat has always been a submarine designer/builder.

- **Electric Boat has designed a liquid metal-cooled reactor plant, a natural circulation reactor plant, and an electric-drive nuclear submarine.** Electric Boat's experience with class designs and one-of-a-kind designs has been brought to bear in development of the latest submarine classes.

- **Because of Electric Boat's experience, Electric Boat is used to resolve systemic submarine fleet problems,** improve existing capabilities, and handle demanding first-of-a-kind technology insertion projects which require experienced engineering support. For example, Electric Boat designed and built the first Vertical Launch System for cruise missiles for SSN 688 Class submarines. Electric Boat developed the installation design for the first Wide Aperture Array on SSN 688 Class, the first propulsor, and completed the redesign for installing the first BSY-1 combat system on SSN 688 Class.

• **Electric Boat design capability is crucial to the industrial base for submarine technology in specialized areas** such as propulsion plant design, structural acoustics, hydrodynamics, weapons handling, and exotic materials. Electric Boat is applying this technology to the New Attack Submarine design.

• **Electric Boat is Pioneering the Design/Build Process for Submarines**.

- **Electric Boat has developed a new approach to submarine design and construction for the New Attack Submarine** based on Electric Boat's past submarine design experience and reviews of other successful manufacturing companies. This approach treats the previously separate design and construction elements as a single process called "design/build". The process is being used in all phases of the design process to optimize the New Attack Submarine design for modular construction and to reduce or eliminate traditional cost drivers.

- **The design/build process uses computerized design tools such as electronic visualization techniques, and a single multi-purpose electronic database, coupled with a team approach** for accomplishing work. This allows the simultaneous application of the skills and abilities of all participants in the submarine design and construction process, starting with the initial phases of design through delivery of the lead ship. This team approach is intended to ensure that:

  - desired ship performance is affordably achieved;
  - correct build strategy is implemented;
  - required tooling is available,
  - construction accessibility and sequence are optimized;
  - producibility is factored into the design;
  - timely material selection and ordering;
  - supplier capability is assessed;
  - construction is accurately planned; and
  - life cycle requirements are fully developed/documented.

- The Navy/DoD decision to select Electric Boat as the design/build yard for New Attack Submarine allows all of Electric Boat's resources to fully participate in the design phase of the program. The design/build process teams individuals with experience and skills in engineering, construction, testing, planning, purchasing, and quality assurance, supplemented by individuals with specialty expertise in analysis, cost estimating, life cycle support, environmental considerations, ship operations, and training. These individuals, with the many diverse skills needed to design, acquire material, construct, test, and support certification of the ship, interact with the designers to ensure their areas of specific skill and interest are addressed from the onset of the design through ship delivery, operation and eventual disposal.

- Benefits from this design/build process (i.e., Integrated Product and Process Development approach) developed at Electric Boat include reduced product development time, meaningful performance vs. cost trade-offs, minimal change and rework, and producible designs, all leading to an affordable, capable platform.

• Electric Boat is the Industry Leader in Submarine Technology Development, including component development, hydrodynamics, acoustics and quieting, composite materials, life support systems, and simulation-based design. Some specific examples of Electric Boat's activities include design and construction of a composite main propulsion shaft, magnetic bearings, distributed electrical systems, and permanent magnet motors. Beyond the specific technology development, Electric Boat's ability to integrate these technologies into the overall submarine design is crucial to a successful submarine design.

CONCLUSION: **The Navy must continue to improve upon what has become an increasingly thin margin of superiority in undersea warfare. To accomplish that, we must preserve the knowledge, skills, and capabilities to design and build ever more technologically advanced submarines. Maintaining the unique technology resource at Electric Boat will do this at a reasonable cost without undue risk to the Navy.**

ATTACHMENT C
PROGRAMMATIC ISSUES RELATED TO COMPETING THE LEAD NEW ATTACK SUBMARINE

A decision to compete construction would, by itself, cause a number of detrimental programmatic problems. For example, competition would:

Impair the New Attack Submarine Design/Build Process. The New Attack Submarine is the first shipbuilding program to use an integrated product and process development approach, i.e., "design/build" process. The key to this approach is early and extensive involvement of all concerned in the design. Specifically, integrated multi-disciplined teams consisting of designers and waterfront personnel from Electric Boat, working alongside Navy personnel and suppliers, bring design, manufacturing, operational and logistics expertise together to create a design which will be efficient to produce and operate. This approach has proved successful in the commercial sector (e.g., the Boeing 777 aircraft).

Free and open communication is essential for the process to work. A decision to compete New Attack Submarine production would have an immediate and chilling impact on communications between design/build participants. Electric Boat no longer would have any incentive to be open and forthcoming with the Navy, knowing that all information would be provided to Newport News Shipbuilding. Additionally, Electric Boat would be more likely to hold back many innovative ideas for their own use in preparing their production contract bid. Also, Government communications with Electric Boat necessarily would be constrained in order to ensure a "fair" competition, not susceptible to successful bid protests.

Undermine Shipbuilder Responsibility. Under the current design/build process, Electric Boat, as both designer and shipbuilder, will be responsible for managing and mitigating the impact of design data revisions on the lead ship construction process.

Newport News cannot be held responsible for the New Attack Submarine design or the impact of design revisions on the construction process unless the Navy pays Newport News to repeat the New Attack Submarine design. Avoiding this large and duplicative expense while conducting a "fair" competition (i.e., equal terms and conditions) for the lead ship requires the Navy to relieve Electric Boat of design responsibility -- destroying another major benefit of the design/build process.

When the Navy is responsible for design data, shipbuilders establish elaborate, expensive and time consuming data review systems to cull out data revisions used to assert contract changes. Determining contractual responsibility and pricing out the impact of these data revisions frequently entails contentious negotiations and numerous, unproductive disputes.

<u>Impede the Design Process.</u> If Newport News were to win, some of the problems experienced in the SEAWOLF program with split design responsibilities could recur without the transfer of the design to Newport News (which would be disruptive, expensive, and time consuming). Specifically, disagreements over priority of design work to support construction, different design philosophies, different computer-aided design/construction tools, different part numbering systems and the like would bog the program down with costly, unproductive administrative burden. All these costs would be charged to the Navy as guarantor of New Attack Submarine design products.

The current Navy plan for awarding a design/build contract to Electric Boat would avoid the above problems.

<u>Summary.</u> The integrated design/build process at Electric Boat for New Attack Submarine facilitates:

- incorporation of innovative, cost saving ideas; and
- management and impact mitigation of design data revisions by the shipbuilder.

A decision to compete the lead New Attack Submarine will likely preclude the Navy from receiving these benefits.

ATTACHMENT D
NAVY SUBMARINE ACQUISITION PLAN

- **Navy Submarine Acquisition Plan -- The Lowest Cost Approach with Acceptable Level of Risk.**

  - **The final SEAWOLF submarine (SSN 23) is budgeted in 1996.** Because SSN 23 already is more than one-third funded, it is the lowest cost attack submarine the Navy can build now. SSN 23 supports the Joint Chiefs of Staff military requirement for attack submarine quieting and is key to maintaining the mix of skills and suppliers needed to initiate building a class of more affordable "New Attack Submarines" starting in 1998.

  - **The New Attack Submarine design builds on important SEAWOLF technological advances.** Through innovative design concepts and a procurement plan that closely integrates the work of designers, builders, and suppliers, the cost of a New Attack Submarine will be close to that of a new 688 Class attack submarine.

  - **This plan is the lowest cost way to sustain the industrial base** for submarines and components (both nuclear and submarine-unique) and enable transition to an affordable attack submarine fleet capable of meeting the threat. Moreover, the Navy's plan implements the DoD strategy for acquisition of nuclear warships.

- **The DoD Nuclear Warship Acquisition Strategy Provides Invaluable Leverage and a Hedge Against Uncertainty.** This strategy maintains two nuclear capable shipbuilders -- Electric Boat Division with submarines -- and Newport News Shipbuilding with aircraft carriers.

  - **The Navy is well into implementing this strategy.** To reduce overhead and ship costs, Electric Boat is continuing to re-engineer organizations and processes. This effort, coupled with the high aircraft carrier construction and overhaul workload the Navy is directing to Newport News, helps both companies survive while providing ships at reasonable cost.

  - **The strategy provides both a hedge against an uncertain future and invaluable leverage that come with having the option to compete.** Moreover, keeping two nuclear capable shipbuilders is consistent with other defense industrial strategies; e.g., the U.S. has five major conventional surface shipbuilders and six military aircraft suppliers.

- **Attack submarines will remain vital to national security.**

  - **The U.S., as a maritime nation, needs a strong Navy, and attack submarines will continue to fulfill a crucial, unique and versatile role.**

- **Attack Submarines are in high demand by our operational CINCs today.** The attack submarine fulfills critical peacetime roles that include regional surveillance, intelligence collection, Joint Naval exercises with our allies, counter-narcotic operations, and other operations, all contributing to our naval forward presence.

- **The DoD position is to maintain a force level of 45-55 attack submarines.** The Joint Chiefs-of-Staff have mandated that 10 to 12 submarines have SEAWOLF-like stealth by the year 2012.

- **For the first time since NAUTILUS put to sea, the United States no longer has the clear advantage** in acoustic stealth. There are Russian submarines at sea and under construction that are quieter, at some speeds, than our improved 688 Class submarines. Despite our advantages in combat systems and crew training, this loss of advantage in acoustic stealth reduces the margin of overall U.S.-to-Russian submarine superiority to its lowest level in history, a condition we are determined to reverse.

- **Around the globe, regional powers recognize that submarines can radically change an entire defense equation at a relatively small military cost.** This understanding is the driving force behind the global proliferation of modern diesel submarines and weapons to these regional powers. Today, there are over 25 modern diesel submarines in construction world-wide. The rationale behind this trend is easily understood: submarines are the original and ultimate stealth weapon system -- one that can be adapted for an unlimited range of missions.

• **The Navy must achieve a continuous and efficient submarine production rate by 2002 to sustain the required attack submarine force levels.**

- Starting in 2011, our remaining 688 attack submarines will reach the end of their service life at a rate of 2 to 4 per year. Given the time span to construct a submarine -- coupled with the fact that future build rates will be at a low rate of production -- we must begin building the new class of submarine as soon as we can, 1998.

- Reaching low rate production by the turn of the century will satisfy vital military requirements and sustain our ability to build submarines, and do so affordably.

- Timely delivery of New Attack Submarines in the next decade is essential for our crews to gain the operational experience necessary to use these ships effectively against a greatly improved potential adversary.

• The challenge is to sustain the industrial base as it shifts to a more affordable attack submarine. The last submarine authorized was SSN 22 in FY 91, and the new design (the "New Attack Submarine") will not be ready to build until FY 98.

• **Authorization of SSN 23 in FY 96 is needed as a "bridge" to the New Attack Submarine.**

- This third and final SEAWOLF Class ship is the most economical and low risk option for maintaining critical submarine industrial base technologies and skills until New Attack Submarine construction can begin in FY 98.

- Already one-third funded, SSN 23 will be a relative bargain to complete.

- SSN 23 supports the JCS requirement for 10 to 12 attack submarines with SEAWOLF-level quieting by 2012.

- Building another 688 Class attack submarine would neither sustain state-of-the-art technology nor meet projected military needs because of the 688's increasing vulnerability to detection and lack of margin for improvement or adaption.

• **The New Attack Submarine design is technologically robust and provides the best balance between cost and capability** (as confirmed by OSD-initiated Independent Review Group). The New Attack Submarine:

- Will retain SEAWOLF quieting specified by the JCS -- at a cost near that of a new 688I.

- Is being designed to achieve the lowest cost possible commensurate with required military capability. For example, reduced speed allows lower acquisition and life cycle costs through simplification, producibility improvements, and new technology (e.g., fewer components, enhanced modular construction, new electric plant design, and life-of-ship core).

- Is being designed with flexibility to adopt future advanced technology. Reconfigurable spaces and modular construction enable adaption to different systems/missions in future ships.

- Will incorporate the best state-of-the-art technology that has become available since the need for a more affordable attack submarine was recognized in 1988.

• **Proceeding in FY 98 with building the lead New Attack Submarine has been endorsed by numerous studies** over past two years by JCS, OSD, Navy, Rand, and the OSD-initiated Independent Review. (See note last page.) These studies have converged on the following:

- Need to build attack submarines that are both affordable and capable to replace 688s ending life in large numbers early next century, even with greatly reduced force level.

- The submarine industrial base and the industrial bases for nuclear and submarine-unique components need a commitment to long-term stable submarine production; it has drastically downsized and is nearing the breaking point. Moreover, shutdown and restart is not practicable; e.g., restart would be necessary shortly after shutdown to maintain a minimal attack submarine force level.

- An FY 98 lead New Attack Submarine start, together with FY 96 authorization of a "bridge" submarine is the most cost effective approach to maintaining U.S. submarine design capability and industrial base.

- Deferring the New Attack Submarine beyond FY 98 would increase total New Attack Submarine program costs and risk; and there are no technological breakthroughs or potential cost reductions on the horizon to justify delaying the New Attack Submarine.

- **The Navy's plan will provide a capable and affordable replacement for 688 Class attack submarines as they reach the end of their service lives in large numbers early in the next century.** The Navy plan allows maintenance of an attack submarine force level of 45 - 55 attack submarines and regains the edge in technology and quieting.

- **The Navy plan preserves the critical design and production components of the nuclear submarine industrial base as national assets.** The loss of a nuclear capable shipbuilder represents an inordinate risk to the Navy's ability to meet U.S. national security needs over the long term. The loss of such a shipbuilder would remove the Navy's ability to ramp up production in response to changes in the world threat, remove the economic stimulus of competition whether implicit or not, and leave no capability in response to natural or other unforeseen disasters.

- **FY 96 and later budgets fully fund an FY 98 lead New Attack Submarine and FY 96 final SEAWOLF.**

CONCLUSION:

- **The United States must retain the ability to build advanced, quiet nuclear submarines** in sufficient numbers to ensure our present and future undersea superiority. The nuclear shipbuilding industry must be able to economically produce submarines at the low production rates required today and also support higher rates of production to meet future uncertainties.

- **The Navy's integrated nuclear shipbuilding plan preserves two national assets capable of responding to future need.**

• The Navy's plan for low-rate production of New Attack Submarines beginning in FY 98 and authorization of SSN 23 in FY 96 will:

- **minimize submarine construction costs and risk over time;**
- **preserve the industrial bases for submarines, nuclear components, and submarine-unique components; and**
- **enable transition to an affordable, capable, and flexible attack submarine fleet.**

Note: Studies include:

- March 1992 Report on Preservation of U.S. Nuclear Submarine Capability by Director, Naval Nuclear Propulsion Program and report update in November 1992.
- June 1992 Report on Preservation of the Industrial Base for Nuclear-Powered Submarine Systems by Assistant Secretary of the Navy (RD&A) and report update in November 1992.
- July 1992 Submarine Force for the Future by Joint Chiefs of Staff and update in April 1993.
- September 1993 Bottom-Up Review and January 1994 annual report to the President by Secretary of Defense.
- June 1994 RAND Corporation Report "Planning Future Submarine Production".
- May 1994 USD(A&T) Independent Review Group Report on NSSN.

Document Separator

NOT FOR PUBLICATION
UNTIL RELEASED BY
SENATE ARMED SERVICES COMMITTEE

STATEMENT OF

RONALD O'ROURKE

SPECIALIST IN NATIONAL DEFENSE

CONGRESSIONAL RESEARCH SERVICE

BEFORE THE

SENATE ARMED SERVICES COMMITTEE

SUBCOMMITTEE ON SEAPOWER

HEARING ON

SUBMARINE ACQUISITION ISSUES

MAY 16, 1995

NOT FOR PUBLICATION
UNTIL RELEASED BY
SENATE ARMED SERVICES COMMITTEE

Ronald O'Rourke -- Biography

Mr. O'Rourke is a Phi Beta Kappa graduate of the Johns Hopkins University, where he received his B.A. in International Studies, and a valedictorian graduate of the Johns Hopkins University's Paul H. Nitze School of Advanced International Studies (SAIS), where he received his M.A. in the same field.

Since 1984, Mr. O'Rourke has worked as a naval affairs analyst at the Congressional Research Service. During that time, he has testified before committees, given many briefings and presentations to Members of Congress and congressional staffers, and written numerous CRS reports on a wide range of issues concerning the U.S. Navy and naval forces in general.

Mr. O'Rourke's work at CRS has focused largely on overall naval force structure planning, aircraft carriers and carrier-based aircraft, surface combatants, and submarines. He also coordinated the 1991 CRS report on the defense-policy implications of the Gulf War.

In addition to two reports that bear indirectly on submarines -- *Naval Forward Deployments and the Size of the Navy* (Report 92-803 F) and *Naval Force-Structure Planning: Breaking Old Habits of Thought* (Report 93-332 F) -- Mr. O'Rourke is the author of several CRS reports and issue briefs on submarine issues, including the following:

- *Navy Attack Submarine Programs: Issues for Congress* (Issue Brief 91098 -- maintained since 1985, updated regularly)
- *Navy New Attack Submarine (NSSN) Program: Is It Affordable?* (Report 94-643 F)
- *Navy Centurion Attack Submarine: What is Affordable?* (Report 93-10 F)
- *Naval Arms Control: A Bilateral Limit on Attack Submarines?* (Report 90-261 F)
- *Nuclear Escalation, Strategic Anti-Submarine Warfare, and the Navy's Forward Maritime Strategy* (Report 87-138 F)

In addition to these reports, Mr. O'Rourke in 1989 wrote an analysis for a Member of Congress on future attack submarine procurement options. This analysis, subsequently released for public distribution, outlined a notional submarine, dubbed the SSN97, as a lower-cost alternative to the Seawolf (SSN-21) design. Some consider the SSN97 to be an intellectual forerunner of the New Attack Submarine program announced to the public in 1991.

In addition to his work for CRS, Mr. O'Rourke has written numerous articles on naval issues for the U.S. Naval Institute Proceedings and other publications. His essay on U.S. naval strategy was the 1988 winner of the Naval Institute's annual Arleigh Burke essay contest.

Mr. O'Rourke has given presentations on naval issues to a variety of audiences in government, industry, and academia, including the programming division of the Navy office of Resources, Warfare Requirements and Assessments (N-8), the Naval War College, the Naval Postgraduate School, the Center for Naval Analyses, and the U.S. Naval Institute. He has spoken three times on the future of the submarine force at the U.S. Submarine League's annual submarine technology symposium.

Mr. O'Rourke is currently preparing a report on the programs for building large ships for the U.S. military and on the six private U.S. shipyards involved in these programs.

Mr. Chairman, distinguished members of the subcommittee, thank you for the opportunity to appear before you to discuss issues relating to the Administration's proposed plans for submarine acquisition.

As requested, the first section of my testimony addresses the general issue of future requirements and building rates for attack submarines. The following two sections discuss the two specific submarine-acquisition issues facing Congress this year:

- First, what should be the near-term, stop-gap measure for maintaining (i.e., "bridging") the submarine construction industrial base until the start of a follow-on submarine acquisition program? This is the issue of whether to fund SSN-23, a third Seawolf (SSN-21) class submarine, at a cost of about $1.5 billion in FY1996 budget authority.

- Second, what should be the follow-on program that starts at the other end of the "bridge"? This is the issue of whether to approve about $1.16 billion in FY1996 funding to continue work on the New Attack Submarine (NSSN) program. The Administration plans to procure the first NSSN in FY1998, but the FY1996 budget request for the NSSN program includes about $705 million in advanced procurement funding for the first boat.

Congress' decisions on these two issues will affect the future configuration of the submarine construction industrial base and the future of the U.S. attack submarine fleet.

As requested, the final section of my testimony discusses the recent analysis of the relative costs of the "2-yard" vs. "1-yard" strategies for acquisition of nuclear-powered warships that was undertaken as a result of a hearing on submarine acquisition issues before the House National Security Committee subcommittee on Military Procurement on March 16, 1995.

SSN FORCE-LEVEL REQUIREMENT AND PROCUREMENT RATE

Two Competing Requirement Statements -- BUR and JCS

Since September 1993, two separate and somewhat divergent statements of the SSN force-level requirement have been allowed to exist and compete for the attention of policymakers. One is a Joint Chiefs of Staff (JCS) requirement first done in 1992 and updated in mid-1993. It calls for a force of 51 to 67 SSNs, including 10 to 12 boats with Seawolf-level stealth by the year 2012. The other is the September 1993 Bottom-Up Review (BUR) force-level goal of 45 to 55 SSNs.

In theory, the BUR force-level goal of 45 to 55 SSNs should be the controlling number -- it came out after the JCS study, and it represented the official position of the Department of Defense. The leadership of the Pentagon, and the civilian leadership of the Department of the Navy, appear to support the BUR number. But the uniformed submarine community, and perhaps to some

Factors driving the requirement

Roles and Missions of Attack Submarines

As stated in the 1993 CRS report entitled Naval Force-Structure Planning: Breaking Old Habits of Thought, it is an oversimplification, particularly in the post-Cold War era, to think of attack submarines solely or even primarily as platforms for countering adversary submarines:

> During the Cold War, U.S. attack submarines were justified primarily in connection with the need to counter Soviet submarines. As a result, U.S. attack submarines are often thought of primarily as antisubmarine warfare (ASW) platforms, and some have questioned the need for U.S. attack submarines in light of the decline in Russian naval capability.
>
> Attack submarines, however, can perform a variety of missions aside from ASW, including covert surveillance and reconnaissance, covert insertion and extraction of spies and special forces, covert Tomahawk cruise missile strikes, covert mining of harbors and coastal areas, and anti-surface warfare. These missions can be performed either independently, or in support of other U.S. military forces. Even during the Cold War, it was probably an oversimplification to think of attack submarines solely as ASW platforms; they performed covert surveillance and insertion/extraction operations as well. In the post-Cold War era, the Navy has indicated that missions other than ASW will receive increased emphasis. In determining requirements for attack submarines, policymakers arguably should consider not just ASW, but the full range of missions that these platforms can perform.

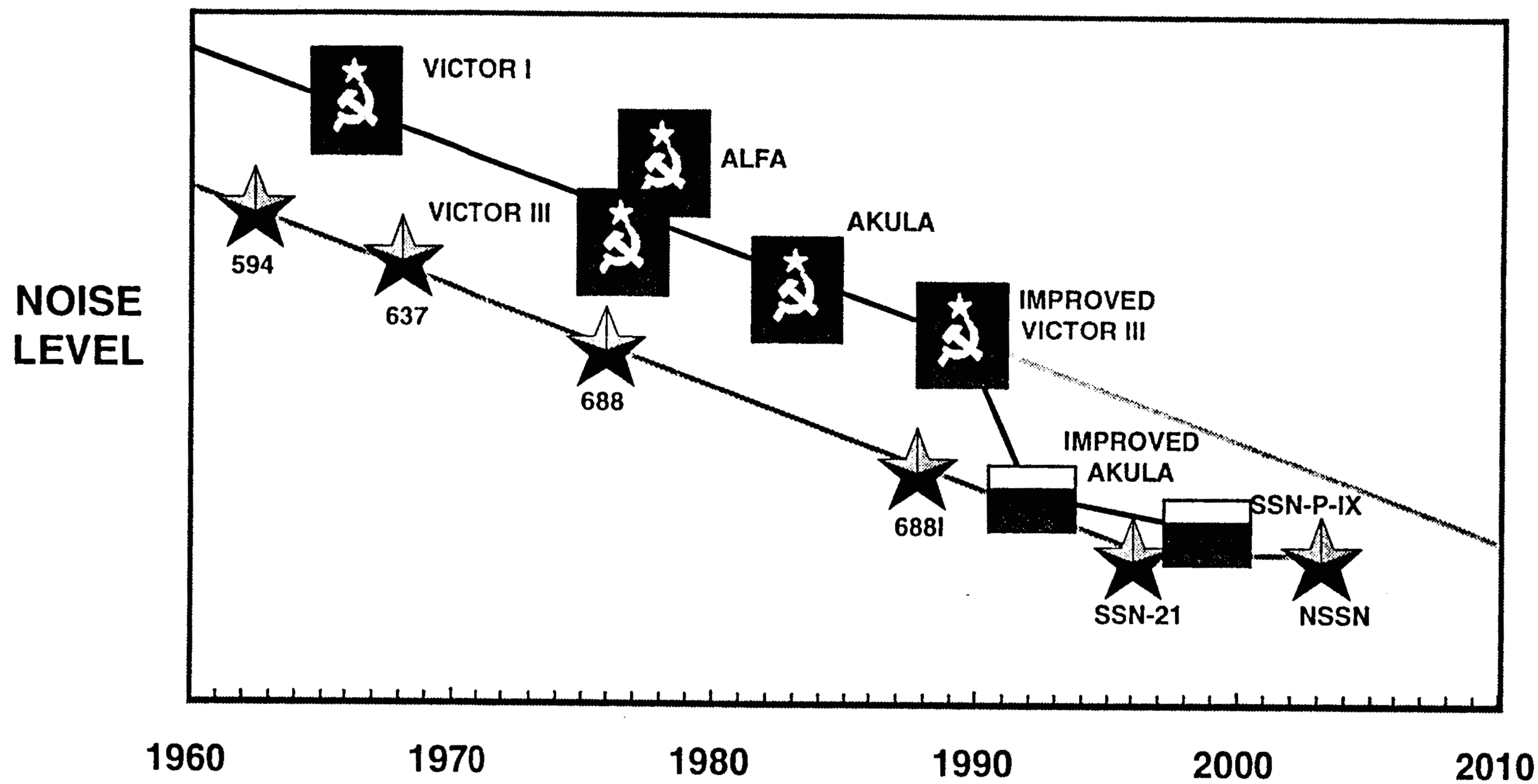
Requirement for overall numbers

As discussed in the Bottom-Up Review, requirements for an attack submarine force of up to about 45 boats are driven by both warfighting considerations (i.e., fighting two nearly simultaneous major regional contingencies) and peacetime deployment considerations (i.e., maintaining forward deployments of attack submarines for purposes of intelligence and surveillance, and for responding rapidly at the outset of a crisis or conflict).

Requirements for an attack submarine force of more than about 45 boats are driven primarily by peacetime deployment considerations. As discussed in the 1992 CRS report entitled Naval Forward Deployments and the Size of the Navy, when limits on personnel tempo, requirements for maintenance and training, and time lost transiting to and from the operating area are fully taken into account, it takes an average of 5.7 attack submarines to keep one continuously deployed in an operating area somewhere around the periphery of Eurasia.

Navy representatives have stated openly that in recent years, 3 or 4 attack submarines have been forward-deployed to the Mediterranean to meet the needs of the theater CINC responsible for that area. In light of this example, it can

Preserving Warfighting Superiority



A second is combat system sophistication -- the ability of the sonars and associated computers on the submarine to detect the noise made by the other submarine, relative to the ability of the sonars and associated computers on the other submarine to do likewise. Together, quieting and combat system sophistication determine which submarine will be the first to detect, localize, and develop a firing solution on the other submarine, and at what range, and at what risk of counterdetection.

A third factor is weapon quality, which includes the sophistication of the guidance package in the front end of the torpedo.

A fourth is crew quality, which is a function of recruiting, training and teamwork.

All factors considered, 688Is are probably more capable than Akula IIs. But the foundation of superiority that the best in-service U.S. SSN has over the best in-service Russian SSN has narrowed, because it no longer includes quieting. The Navy projects that quieting advantage will be recovered with the commissioning of Seawolf-level-stealthy SSNs, but as noted earlier, the recovered margin of quieting superiority is projected to be quite small. Under some circumstances, in fact, such a narrow margin in radiated noise could prove irrelevant.

Of the three other pillars of superiority, two of them -- combat system and weapon quality -- are dependent in part on computer hardware and software. Restrictions on exports of higher-capability computer technology have been relaxed in recent years, and Russia has mathematicians capable of designing sophisticated software algorithms. Consequently, the U.S. margin of superiority in these two areas could also narrow in the years ahead.

Russian submarine production

There appears to be little disagreement about the capability of the submarines that the Russians are now building. The debate centers more on the rate at which the Russians will build them. During the latter years of the Cold War, the Soviets built about 8 submarines per year of all kinds -- about 4 nuclear-powered units, and about 4 non-nuclear powered units, some of which were exported to client states. In 1991, the head of the Soviet Navy told visiting U.S. Navy officials that in the future, the plan was to build 3.5 submarines per year -- 1.5 nuclear-powered boats and 2 non-nuclear-powered boats, of which 1 would be offered for export.

The question is whether the Russians will be able to maintain a building rate of 1.5 nuclear-powered units per year, or whether economic and social conditions will limit production to some lower rate, such as 1 per year or 0.5 per year.

Why are the Russians engaged in a fairly determined effort to design and build new-generation submarines when the other parts of their military, and their economy and society as a whole, are undergoing stress and may even be in

SSN Procurement Rate

A question frequently asked in discussions of U.S. submarine acquisition is whether there can or should be a hiatus in submarine procurement for some number of years. This question is to a large degree moot, because we are already programmed to have a decade-long near-hiatus in submarine procurement during the 1990s. If Administration plans are carried out, then during the decade of the 1990s (FY1990-FY1999), we will procure only 4 attack submarines. These are the last SSN-688 submarine in FY1990, the second Seawolf submarine (SSN-22) in FY1991, the third Seawolf submarine (SSN-23) in FY1996, and the first New Attack Submarine in FY1998. This works out to an average procurement rate of 0.4 boats per year for a period of ten years -- a near-hiatus of considerable length.

The near-hiatus in SSN procurement during the 1990s is an important factor to consider in assessing required future procurement rates. The challenge in maintaining overall numbers of SSNs is not in the short-term or the mid-term. [redacted] without any additional procurement. The problem, rather, begins in the longer term, after 2020, when the 688 force, funded mostly in the 1970s and 1980s, will be mostly gone. This is when the attack submarine force will be composed only of boats funded from about FY1990 onward. It is at this time that the force-level effects of the 1990s near-hiatus in procurement could become manifest.

The long-term average required procurement rate for a given item (sometimes referred to as the steady-state procurement rate) is equal to the required force level divided by the expected service life. As shown in the table on the next page, assuming a 30-year life for SSNs, maintaining a 45-boat force would require a long-term (30-year) average procurement rate of 1.5 boats per year (45 divided by 30 is 1.5).

If the 1990s are considered to be the first 10 years of the 30-year procurement period, and if 4 attack submarines are procured during this decade, then the other 41 boats must be procured in the remaining 20 years of the period. This equates to an average procurement rate of 2.05 boats per year (41 divided by 20 is 2.05). Thus, as a result of the near-hiatus in submarine procurement during the 1990s, a procurement rate of more than 2 boats per year would be required to maintain a force of 45 boats -- the low end of the BUR range -- through the 2020s.

Another way to state this is to say that an average of 15 boats must be procured each 10 years. If 4 attack submarines are procured during the 1990s, then the procurement rate will have fallen 11 boats behind this pace, and maintaining a force of 45 boats will require that these 11 boats be added to the procurement profile for the remaining 20 years of the 30-year procurement period.

If the hiatus in submarine procurement were extended to FY2002 (i.e., no submarines are procured during the period FY1996-FY2001), then only 2 attack submarines (the last SSN-688 and SSN-22, funded in FY1990 and FY1991) will have been procured in the first 12 years (FY1990-FY2001) of the 30-year procurement period. Maintaining a 45-boat force through 2020s would then require procurement of 43 boats in the remaining 18 years of the period, or an average procurement rate of about 2.4 boats per year, as shown in the table above.

The table shows the analogous procurement rates for maintaining a force of 51, 55, or 67 boats through the 2020s following an extended hiatus in procurement -- 2.45, 2.65, and 2.8 boats per year, respectively.

In short, except for a 67-boat force, extending the procurement hiatus to the point where submarines must be procured to replace those retiring at age 30 increases the bow-wave effect.

One strategy for addressing the issue of the downstream procurement bow wave is to hope that in the long run -- that is, by the 2020s -- changes in the international security environment or in military technology will reduce the SSN force-level requirement and thus the required procurement rate. Such changes are possible. But it's also possible that changes between now and the 2020s will increase rather than decrease the SSN force-level requirement, making the procurement bow wave even steeper. If the former scenario occurs, the Nation will have avoided substantial submarine procurement costs. If it doesn't, then policymakers at that time will be presented with a substantially greater and possibly unaffordable procurement requirement.

THE "BRIDGE" ISSUE -- FUND SSN-23 IN FY1996?

Sunk Cost on SSN-23

It is sometimes said that the sunk cost to date on SSN-23 is roughly $900 million, and that therefore only another $1.5 billion in additional expenditures are needed to finish the boat, which has a total cost of about $2.4 billion. This statement, which has been made at various times over the past year or so, is not entirely accurate.

About $920 million in prior-year funding is available for obligation toward SSN-23 -- about $380 million in FY1990 and FY1991 advanced procurement funding for SSN-23, and $540.2 million in additional funding that Congress appropriated as part of a 1992 rescission bill.

The $380 million in FY1990-FY1991 funding has been almost completely obligated and expended. Only a portion of the $540.2 million in 1992 funding, however, has been obligated, and only a portion of that has been expended. Of the total of about $920 million available for obligation, as of May 5, 1995, $806 million has been obligated and $438 million had been expended.

In short, although about $1.5 billion in new (i.e., FY1996) budget authority is needed to complete funding for SSN-23, the amount of money that needs to be expended to finish SSN-23 as of early May was about $2 billion ($2.4 billion less $438 million expended).

If Congress decides to not build SSN-23, then most or all of the unexpended funding from the $920 million would probably have to be used to pay for contract termination costs or costs to support certain key submarine component manufacturers. The Navy has told CRS that if Congress does not finalize such a decision until the end of FY1995, then little or none of this funding would be recoverable for other uses.

Primarily An Industrial Base Issue

Funding SSN-23 would add to the U.S. attack submarine fleet a very capable submarine of which the Navy and the Nation could make considerable use for a period of 30 years. Funding SSN-23 would also marginally contribute to the Administration's goal of maintaining an attack submarine force of at least 45 boats, and it would advance the Navy one boat closer to the 1993 JCS goal of having 10 to 12 attack boats with Seawolf-level stealth by 2012.

Funding the SSN-23 in FY1996, however, is not absolutely necessary to achieve the Administration's goal of maintaining a force of at least 45 attack submarines. The absence of SSN-23 from the force structure could be made up by procuring one additional NSSN at some later point.

Nor is funding SSN-23 in FY1996 absolutely necessary to achieve a force that includes 10 to 12 Seawolf-level-stealthy boats by 2012: Two Seawolf-level-quiet boats -- SSN-21 and SSN-22 -- have already been funded, and as shown in the table below, under the Administration's current plans, another 9 to 11 NSSNs (which would be Seawolf-level-quiet boats) would be funded between FY1998 and FY2006 (and would thus be in service by 2012).

TABLE 2. POTENTIAL NSSN PROCUREMENT PROFILES, FY1996-FY2006

98	99	00	01	02	03	04	05	06	Total
1	0	1	0	1	1	2	1	2	9
1	0	1	0	1	2	1	2	1	9
1	0	1	0	1	2	2	2	2	11

Source: Prepared by CRS, based on U.S. Navy data.

Thus, with regard to meeting stated goals for U.S. attack submarine capability, funding SSN-23 in FY1996 would be militarily helpful but is not funds for the procurement of no other submarines until the first NSSN in FY1998, appeared to express an implicit preference for the 1-yard strategy.

Arguments For Two Yards vs. One

The principal argument in favor of the 2-yard strategy concerns production capacity. Currently, EB and NNS can each build up to 3 submarines per year. The 2-yard strategy thus preserves the option to reconstitute a second submarine construction program (at NNS) to respond to a need to procure submarines at a rate of more than 3 submarines per year. Assuming a 30-year life for submarines, a steady procurement rate of 3 boats per year would be sufficient over the long run to maintain a combined force of 90 ballistic missile and attack submarines.

Current plans call for a combined force of 59 to 81 submarines (14 ballistic missile submarines plus 45 to 67 attack submarines). Assuming a 30-year life for submarines, a force of 59 to 81 boats can be maintained over the long run with a 30-year steady-state production of 2 to 2.7 boats per year. This is less than the 3 boats per year that could be produced by a single yard.

A procurement rate of more than 3 submarines per year, however, might still become necessary, for three reasons.

First, as discussed earlier, the 1990s near-hiatus in submarine procurement has produced a bow wave situation in which maintaining a force of 45 SSNs through the 2020s will require a procurement rate of more than 2 attack submarines per year. If the 14 youngest ballistic missile submarines are replaced on a one-for-one basis when they retire, then a period will come after the turn of the century when there will be an additional requirement for one ballistic missile submarine per year for 14 years. This production would be in addition to any ongoing production of attack submarines. The combined procurement rate of attack and ballistic missile submarines could thus be more than 3 boats per year for several years.

Second, changes in the international security environment or in military technology may create a requirement for rapidly expanding the size of the attack submarine force from a BUR-like level of, say, about 50 boats to the high-end JCS figure of 67 boats. Accomplishing such a buildup in a short period of time could require a procurement rate of 4 or more boats per year for a period of several years.

Third, changes in the international security environment or in military technology could result in an increase in the attack submarine force-level requirement to a number even higher than the high-end JCS figure of 67 boats. Some analysts, for example, have argued that the vulnerability of surface combatants to advanced enemy anti-ship weapons in the early 21st Century could lead to a revised U.S. fleet architecture that relied more heavily on submarines to carry out various missions.

year, with the addition of a $5 million dollar crane, the yard's submarine production capacity could be increased to a bit more than 4 boats per year. More recently, NNS officials told CRS that, upon reexamining the issue, they had determined that NNS could produce 4 boats per year even without the $5 million crane.

Alternatively, if NNS's submarine production capacity remains at 3 boats per year, it might be possible to reestablish a second submarine-construction site -- at the EB location, or Ingalls Shipbuilding in Pascagoula, Mississippi (which built nuclear-powered submarines until the early 1970s), or at one of the naval shipyards (which also built nuclear-powered submarines until the early 1970s) -- to respond to a need to build more than 3 submarines per year. But reconstituting a second submarine-construction yard would involve more time, expense, and technical risk than under the Administration's 2-yard strategy. Also, if some unforeseen event shuts down production at NNS, the country would have no other facility capable of continuing production of nuclear-powered warships.

Bridging Options for a 2-Yard Strategy

If a split industrial arrangement -- a 2-yard strategy -- is preferred, and if procurement of the New Attack Submarine is to begin in FY1998, with advanced procurement funding in FY1996, then it appears that some kind of submarine construction work for EB would need to be funded in FY1996. There are at least four potential options for providing such work:

- fund SSN-23 (the Administration's plan)
- fund a portion of SSN-23
- fund construction of outfitted SNN-688 hull sections
- fund 1 or 2 SSN-688 class submarines

Building SSN-23 would contribute toward meeting the JCS goal of having 10 to 12 Seawolf-level-stealthy boats by the year 2012, although as discussed earlier, this goal can be met without funding SSN-23 in FY1996.

The option of funding construction of only a portion of SSN-23 -- such as the aft section, where the already-ordered propulsion plant would be installed -- has not been fully examined in public discussion. Building only a portion of SSN-23 might not preserve a sufficient business base at EB until FY1998, although this could be addressed by transferring some additional submarine overhaul and repair work to EB from the naval shipyards. And building only a portion of SSN-23 would not provide the Navy with a usable submarine. (The aft section might be used as a land-based training or research and development asset, but the Navy has not expressed a need for such an asset.) Building only a portion of SSN-23 could, however, be less expensive than procuring the whole submarine.

If the start of New Attack Submarine procurement is deferred beyond FY1998, the industrial base bridge for EB would have to be lengthened. For example, in addition to procuring SSN-23 or one or two additional SSN-688s in FY1996, additional Seawolf or SSN-688 class submarines might have to be procured in later years.

Bridging Options for a 1-Yard Strategy

If a consolidated industrial arrangement at NNS -- a 1-yard strategy -- is preferred, and if procurement of the New Attack Submarine is to begin in FY1998, then, as discussed earlier, policymakers have the option of not funding any submarine construction work in FY1996. As discussed earlier, this option may require the transfer of some submarine overhaul and repair work to NNS from the naval shipyards.

If the start of New Attack Submarine procurement is deferred much past the turn of the century, then NNS might have to be provided with some kind of interim submarine construction work.

THE FOLLOW-ON ISSUE: APPROVE FY1996 NSSN FUNDING?

NSSN vs. 688I and Seawolf

The Navy's goal for the New Attack Submarine (NSSN) program is to develop a multimission SSN that is (1) substantially less expensive than the Seawolf design, (2) capable enough to maintain U.S. undersea superiority against a reduced but still-continuing Russian submarine development and construction effort, (3) more capable than the Seawolf or 688I designs for operations in littoral (near-shore) areas, and (4) better able than the Seawolf or 688I designs to incorporate major new submarine technologies when they become available.

As envisioned by the Navy, the NSSN would be as quiet as the Seawolf, would have a submerged displacement of about 7,500 tons, and would be armed with a total of 38 weapons (including 12 additional Tomahawk cruise missiles in a 12-cell VLS). Compared to the 688I and Seawolf designs, the NSSN design would have improved features for operations in littoral waters, including better shallow-water maneuverability, a sail with a reduced radar cross section, and a better capability for covertly delivering special operations forces. The Navy estimates the procurement cost for follow-on NSSNs to be about $1.5 billion in FY1998 dollars, compared to $2.1 billion for additional Seawolf submarines or $1.4 billion for additional 688Is.

The NSSN design is also intended to be more flexible and adaptable than the 688I or Seawolf designs. The NSSN would feature a torpedo room that can be used as a reconfigurable internal space for carrying specialized mission packages. In addition, the NSSN would be designed so that follow-on NSSN units can easily be built with new and different hull sections. This latter feature, which is called modular reconfigurability, would permit the baseline for NSSN procurement. This share will depend on the size of the shipbuilding budget, the NSSN procurement rate, and the NSSN's unit procurement cost.

Under the recapitalization plan it presented to Congress last year, the Navy stated that it wanted to increase the shipbuilding budget (the Shipbuilding and Conversion, Navy [SCN] appropriation account) from its current level to about $9.4 billion in FY1998 dollars by the turn of the century. The submarine community would like to procure the NSSN at a rate of two per year starting around FY2003; Navy testimony on its long-range plan suggested a budgeted rate of 1.5 boats per year.

The Navy last year estimated the unit procurement cost for follow-on boats in the NSSN class (defined last year as the average for boats 2 through 30 in a notional 30-ship buy) to be $1.54 billion each in FY1998 dollars. The Navy subsequently redefined "follow-on boats" to mean the fifth boat in the class. Under this new definition, the Navy reported to Congress in March, the estimated cost is $1.55 billion in FY1995 dollars. This figure is about 9 percent higher than last year's estimated cost of $1.54 billion in FY1998 dollars. This does not mean that the estimated follow-on cost of the boat has increased 9 percent; it means only that the cost of the fifth boat in the class is about 9 percent more than the average for boats 2 through 30. Boats 2 through 4 cost more than boat 5, and boats 6 through 30 cost less than boat 5.

~~During the Cold War, procurement of attack submarines accounted for an average of about 20 percent of SCN. In its testimony last year, Navy officials suggested that about 26 percent of a $9.4 billion annual SCN budget would be allocated for procurement of 1.5 NSSNs per year.~~

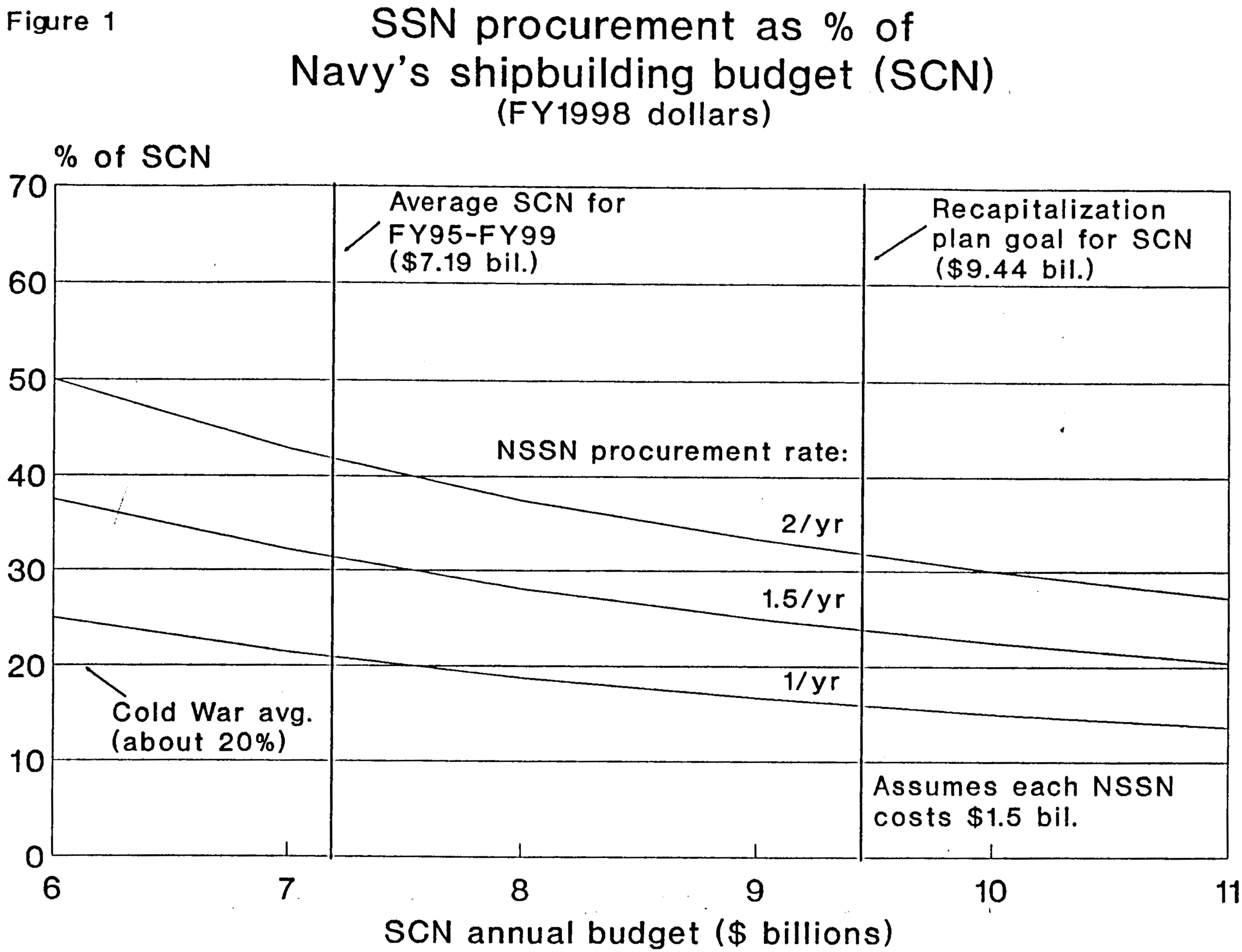
The 1994 report on the affordability of the NSSN program concluded the following:

- If the NSSN procurement rate is 1.5 boats per year, the Navy is successful in its plan to increase SCN to $9.44 billion by the turn of the century, and the NSSN's unit procurement cost is $1.5 billion in FY1998 dollars, then NSSN procurement will require 24 percent of SCN -- a share not much higher than Cold War average of 20 percent, and slightly less than the 26-percent allocation mentioned in the Navy's testimony last year;

- If the NSSN procurement rate is 2 boats per year, then NSSN procurement will require more than 30 percent of SCN, even if SCN is $9.44 billion and the NSSN's unit procurement cost is $1.5 billion in FY1998 dollars. This is somewhat higher than the 26-percent allocation mentioned in the Navy's testimony, and significantly higher than the Cold War average of 20 percent;

- If SCN falls short of $9.44 billion or the NSSN's unit procurement cost exceeds $1.5 billion in FY1998 dollars, or both, then for a procurement rate of 1.5 boats per year, the share of SCN required for NSSN procurement could approach or exceed 30 percent. For a

Figure 1



Prepared by CRS, 6/94, based on U.S. Navy data. See text for discussion.

NEW ATTACK SUBMARINE: PRE-MILESTONE 1

88-90	NAVSEA/NR Focus on SEAWOLF Follow on
1990	SECNAV/CNO/NAVSEA/NR Discussions Studies and Testing Coordinated Maintain SEAWOLF Stealth Trade Speed for Cost Simplify
2/91	SECNAV Issues New Attack Sub Tasking - CNO - requirements - NAVSEA - ship evaluations - NR - propulsion plant
6/91	OPNAV Staff Requirements Report Submarine Operational CDR Input
2/92	CNO Issues Requirements Range
1992	Numerous NAS Concept Briefs: OSD, JCS, Congress
→ 8/92	Milestone 0
1993	Submarine Operator-Design interface Teams Established
9/93	Joint Staff Approves Basic Submarine Characteristics
→ ~~X~~ 6/94	Milestone 1

all the ships at one yard. This does not include any added costs that might be incurred as a result of materials being ordered by two yards in smaller quantities rather than by one yard in larger quantities.

If competition is not introduced until the procurement rate reaches two per year, the first boat to be competed would be the fourth boat procured. If the yard that built the first three boats achieves an 87 percent learning curve on NSSN production, then this yard would have a 24 percent cost advantage over the other yard in bidding for the fourth boat due to learning-curve effects alone. This does not include any additional cost advantage due to the reconstitution costs that the other yard would face to reestablish submarine production after a hiatus of several years.

If the objective is to employ competition in building NSSNs, another approach would be to hold a competition at the start of NSSN procurement and have it be a winner-take-all competition. This could generate significant competitive leverage for the Government, and it would avoid the added costs associated with splitting a low-production-rate program between two sources.

If a winner-take-all competition were held for NSSN production, the question of whether there should be a split or consolidated arrangement for nuclear warship construction would be decided not by deliberate policy choice, but as a consequence of the outcome of the competition.

To ensure that an up-front, winner-take-all competition for building NSSNs is conducted on a level playing field, certain actions might have to be taken, including the following:

- SSN-23 or some other type of submarine construction work for EB might have to be funded in FY1996 to ensure that EB could be a healthy competitor in FY1998.

- Funding might have to be provided to maintain NNS's submarine-construction capability until FY1998 on a level equal to EB's, and the one-time costs of reconstituting submarine production at NNS in FY1998 after a hiatus of a few years might have to be addressed in the bidding process.

- NNS would need to be maintained as a full observer and consultant, if not a direct participant along with EB and the Navy, throughout the NSSN design process, so that NNS would have an understanding of the NSSN design equal to EB's.

- Any features incorporated into the NSSN design to help optimize the design specifically for EB's production processes and methods would have to be removed from the design, so that the design does not provide EB with a built-in cost advantage.

Limitations of RAND Report

At present, the most thorough independent study of the submarine construction industrial base is the 1994 RAND report entitled *The U.S. Submarine Production Base: An Analysis of Cost, Schedule, and Risk for Selected Force Structures*. Although this report is thorough and helpful on the many questions it addresses, no report of manageable length could cover every aspect of the issue, and the RAND report has certain limitations in scope. In particular, the RAND report, which responded to specific tasking from the Office of the Secretary of Defense, does not directly address three issues of potential interest to Congress.

The first of these is the primary issue under consideration here -- the relative overall costs of the 2-yard and 1-yard strategies. The report examines separate reconstitution costs at EB and NNS, and presents information on production rates if submarines are produced at two yards rather than one. But it does not look at the overall cost to the government of having nuclear warships produced at 2 yards vs. 1.

The second issue it does not address is the scenario in which NNS reconstitutes submarine construction at the end of the 1990s after receiving both carrier construction work (CVN-76) and submarine overhaul and repair work. The study looks only at scenarios where NNS has one form of work but not the other. The omission of the scenario where NNS has both forms of work simultaneously is potentially significant, because NNS officials have based their presentations to Congress on this scenario, and not on the scenario of having only one form of work or the other. The RAND report provides estimates of how the cost of reconstituting submarine construction work at NNS is reduced if NNS has either form of work. But it does not provide an estimate of how these costs might be further lowered if NNS has both forms of work. The report thus cannot serve as an independent source of information on this particular point.

Third, the report examines only one option for providing EB with submarine construction work (as opposed to submarine overhaul and repair work) as a bridge to the start of NSSN production, namely, construction of SSN-23. It does not examine other options for providing submarine construction work, such as building only a portion of SSN-23, building special-mission hull sections for backfitting into existing SSN-688s, or building 1 or 2 additional Improved SSN-688 class submarines. The report thus cannot serve as an independent source of information on the costs of these options or on the question of whether building SSN-23 represents the most cost-effective form of submarine-construction work for bridging EB to the start of NSSN production.

Shorter- and Longer-Term Cost Consequences

A decision by Congress to allocate NSSN production to EB or NNS would have both shorter- and longer-term cost consequences. Accordingly, the analysis was designed to examine both shorter- and longer-term cost consequences. The study examines costs during the period FY1996-FY2012.

the review by the 3 congressional support agencies began at that time and was to be completed within one week.

None of the parties involved in the effort had full visibility of all aspects of the study. NNS did not have access to EB business-sensitive data, or to the Navy's modeling or estimating methods. The Navy did not have access to NNS's submission, although it did have access to an earlier cost study that NNS generated on its own and submitted to the Navy prior to the start of this analysis. The 3 congressional support agencies, in large part because of time constraints, had only limited exposure to NNS's and the Navy's data and modeling and estimating methods.

The results of the analysis add substantially to the very limited amount of information on the issue that existed prior to the analysis. Nevertheless, the [redacted]

Shorter-Term Cost Effects

The shorter-term cost effects of switching from the Administration's preferred 2-yard strategy to the 1-yard strategy include the one-time transitional cost effects of switching planned NSSN production from EB to NNS and the potential NSSN production savings (due to economies of scope) that NNS might achieve (relative to the Administration's plan) during the NSSN production startup period when the procurement rate will be less than 1 boat per year. The one-time transitional cost effects include but are not necessarily limited to the following:

- **Not funding SSN-23.** This includes not approving the requested FY1996 funding to complete funding for SSN-23, plus the recovery of any unexpended portion of the prior-year funding available for SSN-23.

- **Funding an additional NSSN.** The analysis was set up to compare strategies for producing an equal number of SSNs. Since the 1-yard strategy does not require funding SSN-23 in FY1996, an additional NSSN was added in a subsequent year to the 1-yard strategy to make up the difference. The year chosen was FY2002, which was the year outside the FYDP that was closest to FY1996, and a year in which there is some uncertainty as to whether the number of boats to be funded will be 1 or 2.

- **Supporting or reconstituting component sources.** This includes the costs of supporting component vendors that were to have been supported by SSN-23 or reconstituting these sources at a later point either as independent vendors or as in-house NNS manufacturing capabilities.

- **Submarine close-down at EB.** This would include any costs which the Federal government would be obligated to pay as a result of the

- **Cost of labor.** Bargaining conditions between management and the work force over wages and benefits at EB and NNS under the 2-yard strategy might differ from those at NNS under the 1-yard strategy. This could lead to a differential between the two strategies in the area of wages and benefits.

- **Productivity of labor.** The need to move workers from one form of work to another, or opportunities for doing so, may differ under the 2-yard and 1-yard strategies. This could lead to a differential between the two strategies in the area of overall labor productivity.

- **Cost of materials.** The degree of efficiency with which materials may be ordered by EB and NNS under the 2-yard strategy may differ from the degree of efficiency with which materials might be ordered by NNS under the 1-yard strategy.

- **Fixed overhead costs.** A principal argument made by those in favor of the 1-yard strategy is that the various forms of work performed would bear the fixed overhead costs of 1 nuclear shipyard rather than 2.

Results and Comments

NNS's and Navy's Results Converted to FY1996 Dollars

Both NNS and the Navy prepared estimates of the cumulative savings that result over the period FY1996-FY2012 from adopting the 1-yard strategy rather than the Administration's preferred 2-yard strategy. NNS's estimates, which covered all 8 scenarios, were calculated in then-year dollars using a steady 4 percent escalation (inflation) rate. Other escalation rates which can be used include the CPI-U rate of 3.4 percent, which CBO uses in its January 1995 report entitled *The Economic and Budget Outlook: Fiscal Years 1996-2000*, and 3.0 percent, which the DOD Comptroller uses as its escalator for purchases in its March 1995 report entitled *National Defense Budget Estimates for FY1996.*

Another option is to convert NNS's estimates to constant FY1996 dollars by subtracting out the effects of NNS's 4 percent escalation rate.

A third option is to convert NNS's estimates into discounted dollars. This involves the use of a discount rate on constant-dollar figures to reflect the value of spending money now rather than at some point in the future. In its 1994 report on the submarine production base, RAND presents discounted-dollar calculations and states:

> Decisions regarding spending and investment over the long term should be made on the basis of discounted dollars. Some would say that no saving results from postponing a billion-dollar purchase by ten years, that it's "just moving money around." But that ignores the value most people would ascribe to having the benefits of that purchase now rather than later (whether that money goes to a submarine or some other purpose).

TABLE 5. NNS AND NAVY ESTIMATED TOTAL SAVINGS, FY1996-FY2012
(in billions of constant FY1996 dollars)

	Scenario								
	1A	1X	1B	2A	2B	3A	3B	4A	4B
NNS estimate	5.8	n/a	5.5	5.4	5.2	5.2	4.9	4.8	4.6
Navy estimate	1.9	1.3	0.8	n/a	n/a	n/a	n/a	n/a	n/a

Source: Prepared by CRS based on NNS and Navy data.

As can be seen in the table, for scenarios where estimates are available from both NNS and the Navy (scenarios 1A and 1B), the Navy and NNS agree that a 1-yard strategy is less expensive than the 2-yard strategy, but disagree substantially on the amount of savings that would be realized by the 1-yard strategy. This difference is due to differences between the NNS and Navy estimates for both shorter-term cost effects and longer-term cost effects.

Longer-term cost effects are most easily viewed during the period FY2006-FY2012. This is the period after shorter-term transitional cost effects have played themselves out, and when the NSSN program reaches steady-state production conditions in the shipyard. The table below presents estimated longer-term cost effects during the period FY2006 to FY2012 in the form of an average annual figure. The table includes scenario 1A (which results in the highest estimated savings figure for both the Navy NNS), scenario 1X (which the Navy believes to be the most realistic scenario, and which results in the lowest estimated savings figure for the Navy), scenario 1B (for which both the Navy and NNS made estimates), and scenario 4B (which results in the lowest estimated savings figure for NNS).

TABLE 6. ESTIMATED AVERAGE ANNUAL RECURRING SAVINGS, FY2006-FY2012
(in millions of constant FY1996 dollars, rounded to the nearest five million)

	Scenario			
	1A	1X	1B	4B
NNS estimate	330	n/a	325	230
Navy estimate	130	60	75	n/a

Source: Prepared by CRS based on NNS and Navy data.

ATTACHMENTS:

BRIEFING SLIDES CITING JCS REQUIREMENT
FOR 51 TO 67 SSNs, INCLUDING
10 TO 12 BOATS WITH SEAWOLF-LEVEL STEALTH BY 2012

Attached are Navy briefing slides, except the slide entitled "Conclusions - Cost Related Factors," which is taken from the report of the Navy-appointed independent NSSN study group, also known as the Reynolds panel.

Joint Staff Mandate

- *10 to 12 submarines* with SEAWOLF level of stealth *by 2012*

  - ➤ Capability = C (# of ships) + c (Individual Ship Capability)
    - "c" can not be compromised in submarines
    - Russians have always enjoyed numerical superiority

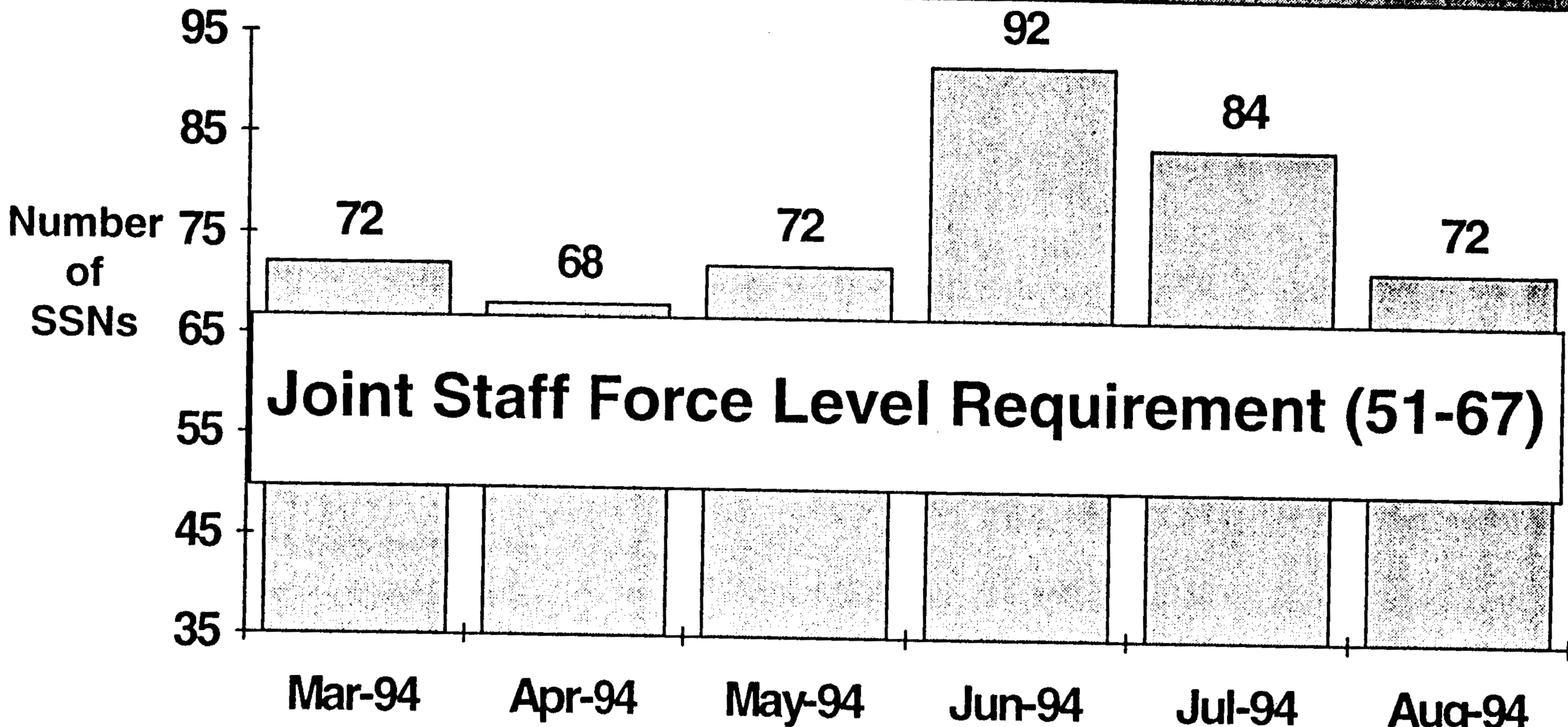
  - ➤ Quality counts
    - Russians build high performance advanced capability submarines

Conclusions - Cost Related Factors
Timing/Force Structure Observations

- *Draft RAND study (18 March 1994):*
  - *"Less than a billion dollar savings given longest gaps feasible"*
  - *"Further risks may jeopardize nuclear submarine program"*
  - *"Recommend continued submarine production"*
- ***FY98 Authorization** needed to maintain minimum force structure*
  - *One year delay removes decision maker's force level options*
  - *Delay makes "10-12 by 2012" Joint Staff objective unachievable*
- *Low rate NSSN production signals long term commitment*
  - *Provides stability during industry restructure*
  - *Preserves **submarine design capability***

Production Gap savings do <u>not</u> justify the risk
- FY98 NSSN recommended

*Required Attack Submarine Force Levels Based on Present Day Commitments**



*Requirements determined from Actual Deployed Submarines multiplied by the Deployment Planning Factor

Projected Force Levels <u>inadequate</u> to meet present day Force Level Requirements

N87

Document Separator

TITLE III—DEPOT-LEVEL MAINTENANCE

SEC. 301. ELIMINATION OF 60/40 RULE FOR PUBLIC/PRIVATE DIVISION OF DEPOT-LEVEL MAINTENANCE WORKLOAD.

(a) ELIMINATION OF RULE.—Section 2466 of title 10, United States Code, is amended—

(1) by striking out subsections (a), (c), (d), and (e); and

(2) by striking out "(b) PROHIBITION ON MANAGEMENT BY END STRENGTH.—".

(b) CONFORMING AMENDMENTS.—(1) The heading of such section is amended to read as follows:

"§2466. Civilian employees involved in depot-level maintenance and repair of materiel: prohibition on management by end strength".

(2) The item relating to such section in the table of sections at the beginning of chapter 146 of such title is amended to read as follows:

"2466. Civilian employees involved in depot-level maintenance and repair of materiel: prohibition on management by end strength.".

SEC. 302. PRESERVATION OF CORE MAINTENANCE AND REPAIR CAPABILITY.

(a) IN GENERAL.—(1) Chapter 146 of title 10, United States Code, is amended by adding at the end the following new section:

"§2472. Core maintenance and repair capability: preservation

"(a) NECESSITY FOR CORE MAINTENANCE AND REPAIR CAPABILITIES.—It is essential for the national defense that the Department of Defense preserve an organic maintenance and repair capability (including personnel, equipment, and facilities) to meet readiness and sustainability requirements established by the Chairman of the Joint Chiefs of Staff for the systems and equipment required for contingency plans approved by the Chairman of the Joint Chiefs of Staff under section 153(a)(3) of this title.

"(b) IDENTIFICATION OF CORE MAINTENANCE AND REPAIR CAPABILITIES.—The Secretary of Defense shall identify those maintenance and repair activities of the Department of Defense that are necessary to preserve the maintenance and repair capability described in subsection (a). The Secretary may identify for such purpose only those activities of the Department of Defense that are necessary to ensure a ready and controlled source of technical competence for that purpose. The Secretary may not idenity for such purpose any intermediate-level or depot-level maintenance or repair activity.

"(c) LIMITATION ON CONTRACTING.—The Secretary may not contract for the performance by non-Government personnel of a maintenance activity identified by the Secretary under subsection (b) under the procedures and requirements of Office of Management and Budget Circular A–76 or any successor administrative regulation or policy unless the Secretary of Defense determines (under regulations prescribed by the Secretary) that Government performance of the activity is no longer required for national defense reasons.

"(d) CONTRACTING FOR PERFORMANCE OF NON-CORE FUNCTIONS.—In the case of any maintenance or repair activity (including the making of major modifications and upgrades) that is not identified by the Secretary under subsection (b), the Secretary concerned shall provide for the performance of that activity by an entity in the private sector, selected through the use of competitive procedures, unless the Secretary determines that the performance of that activity by a Government entity is necessary to maintain the defense industrial base."

(2) The table of sections at the beginning of such chapter is amended by adding at the end the following new item:

"2472. Core maintenance and repair capability: preservation.".

(b) REVISION OF REGULATIONS.—The Secretary of Defense shall revise the existing Department of Defense regulations relating to depot level maintenance and repair activities in order to ensure the consistency of those regulations with the policy provided in section 2472(d) of title 10, United States Code, as added by subsection (a).

SEC. 303. PERFORMANCE OF DEPOT-LEVEL MAINTENANCE WORKLOAD BY PRIVATE SECTOR WHENEVER POSSIBLE.

(a) REQUIREMENT.—Section 2469 of title 10, United States Code, is amended to read as follows:

"§2469. Depot-level maintenance and repair activities: use of private sector

"(a) IN GENERAL.—The Secretary of Defense shall (except as provided in subsection (b)) provide for the performance by private sector entities of all depot-level maintenance and all depot-level repair work of the Department of Defense.

"(b) EXCEPTION.—The Secretary may provide for the performance of a particular depot-level maintenance workload, or a particular depot-level repair workload, by an entity of the Department of Defense if—

"(1) no responsive bids for performance of that workload are received from responsible offerors; or

"(2) the Secretary makes a determination tha subsection (a) must be waived for that particula workload for reasons of national security.".

(b) CLERICAL AMENDMENT.—The item relating t section 2469 in the table of sections at the beginning o chapter 146 of such title is amended to read as follows

"2469. Depot-level maintenance and repair activities: use of private sector.".

[redacted]

Eighth, the bill consolidates duplicative military and industry maintenance and repair depots. The bill prohibits the Defense Department from performing depot and intermediate level maintenance and repair work, unless industry is unwilling to perform the work. Therefore existing repair depots must be either privatized or shut down.

Mr. President, large savings can be realized from the comprehensive reforms I am proposing. I anticipate that my approach will reduce acquisition management personnel by as much as 25 to 30 percent through reduction in duplicative headquarters staffs. The Defense Science Board Task Force on Defense Acquisition Reform reported in July 1993 that a comprehensive reform along the lines I am proposing would save $ 20 billion per year. The House Budget Committee has included $ 3.5 billion in its budget reduction proposal, and the Congressional Budget Office conservatively estimates the savings at about $ 1.7 billion per

141 Cong Rec S 4808, *S4809

year.

In summary, there is both a need and an opportunity for reforming Defense acquisition. But, Mr. President, I must point out that bureaucracies are inherently unable to reform themselves. The time has come for us to make some very hard and difficult decisions which have far-reaching impact on the future of our country. Change must be brought about by those of us who are concerned about maintaining a strong defense within today's budget constraints.

Mr. President, I ask that the full text of the bill and a letter be printed in the Record .

There being no objection, the material was ordered to be printed in the Record , as follows:

S. 646 Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the ``Department of Defense Acquisition Management Reform Act of 1995''.

141 Cong Rec S 4808, *S4809

SEC. 2. TABLE OF CONTENTS.

The table of contents for this Act is as follows:

[redacted]

TITLE III-DEPOT-LEVEL MAINTENANCE

SEC. 301. ELIMINATION OF 60 1A/ 1A40 RULE FOR PUBLIC 1A/ 1APRIVATE DIVISION OF DEPOT-LEVEL MAINTENANCE WORKLOAD.

(a) Elimination of Rule .-Section 2466 of title 10, United States Code, is amended-

(1) by striking out subsections (a), (c), (d), and (e); and

(2) by striking out ''(b) Prohibition on Management by End Strength .-''.

(b) Conforming Amendments .-(1) The heading of such section is amended to read as follows:

'' 1A2466. Civilian employees involved in depot-level maintenance and repair of materiel: prohibition on management by end strength''.

(2) The item relating to such section in the table of sections at the beginning of chapter 146 of such title is amended to read as follows:

'' 2466. Civilian employees involved in depot -level maintenance and repair of materiel: prohibition on management by end strength.''.

SEC. 302. PRESERVATION OF CORE MAINTENANCE AND REPAIR CAPABILITY.

(a) In General .-(1) Chapter 146 of title 10, United States Code, is amended by adding at the end the following new section:

'' 1A2472. Core maintenance and repair capability: preservation

''(a) Necessity for Core Maintenance and Repair Capabilities .-It is essential for the national defense that the Department of Defense preserve an organic maintenance and repair capability (including personnel, equipment, and facilities) to meet readiness and sustainability requirements established by the Chairman of the Joint Chiefs of Staff for the systems and equipment required for contingency plans approved by the Chairman of the Joint Chiefs of Staff under section 153(a)(3) of this title.

''(b) Identification of Core Maintenance and Repair Capabilities .-The Secretary of Defense shall identify those maintenance and repair activities of the Department of Defense that are necessary to preserve the maintenance and repair capability described in subsection (a). The Secretary may identify for

such purpose only those activities of the Department of Defense that are necessary to ensure a ready and controlled source of technical competence for that purpose. The Secretary may not identify for such purpose any intermediate-level or depot-level maintenance or repair activity [redacted] .-The Secretary may not contract for the performance by non-Government personnel of a maintenance activity identified by the Secretary under subsection (b) under the procedures and requirements of Office of Management and Budget Circular A-76 or any successor administrative regulation or policy unless the Secretary of Defense determines (under regulations prescribed by the Secretary) that Government performance of the activity is no longer required for national defense reasons. [*S4820]

''(d) Contracting for Performance of Non-Core Functions .-In the case of any maintenance or repair activity (including the making of major modifications and upgrades) that is not identified by the Secretary under subsection (b), the Secretary concerned shall provide for the performance of that activity by an entity in the private sector, selected through the use of competitive procedures, unless the Secretary determines that the performance of that activity by a Government entity is necessary to maintain the defense industrial base.''.

141 Cong Rec S 4808, *S4820

(2) The table of sections at the beginning of such chapter is amended by adding at the end the following new item:

''2472. Core maintenance and repair capability: preservation.''.

(b) Revision of Regulations .-The Secretary of Defense shall revise the existing Department of Defense regulations relating to depot level maintenance and repair activities in order to ensure the consistency of those regulations with the policy provided in section 2472(d) of title 10, United States Code, as added by subsection (a).

SEC. 303. PERFORMANCE OF DEPOT-LEVEL MAINTENANCE WORKLOAD BY PRIVATE SECTOR WHENEVER POSSIBLE.

(a) Requirement .-Section 2469 of title 10, United States Code, is amended to read as follows:

'1A2469. Depot-level maintenance and repair activities: use of private sector

''(a) In General .-The Secretary of Defense shall (except as provided in subsection (b)) provide for the performance by private sector entities of all

141 Cong Rec S 4808, *S4820

depot-level maintenance and all depot-level repair work of the Department of Defense.

''(b) Exception .-The Secretary may provide for the performance of a particular depot-level maintenance workload, or a particular depot-level repair workload, by an entity of the Department of Defense if-

''(1) no responsive bids for performance of that workload are received from responsible offerors; or

''(2) the Secretary makes a determination that subsection (a) must be waived for that particular workload for reasons of national security.''.

(b) Clerical Amendment .-The item relating to section 2469 in the table of sections at the beginning of chapter 146 of such title is amended to read as follows:

''2469. Depot-level maintenance and repair activities: use [illegible]

[redacted]

Aerospace Industries Association, American Defense Preparedness Association, American Electronics Association, Contract Services Association, Electronic

141 Cong Rec S 4808, *S4820

Industries Association, National Security Industrial Association, Shipbuilders Council of America, U.S. Chamber of Commerce,

March 29, 1995.

Senator William V. Roth, Jr.,

U.S. Senate, Washington, DC. Dear Senator Roth: As the associations representing the hundreds of thousands of American workers employed in the aerospace, electronics, shipbuilding and services industries, we offer our strong support for the depot maintenance provisions included in your procurement reform legislation. We urge prompt action on these provisions in order to achieve their enactment in this session of Congress.

The elements of your proposal that repeal the $ 3 million threshold for the shift of depot workload to the private sector and the repeal of the so-called 60/40 rule will eliminate management restrictions long opposed by the Department of Defense as well as the private sector. The elimination of these restrictions as called for by your bill will afford the government much greater flexibility to obtain the most cost effective use of every dollar spent on defense logistics support.

141 Cong Rec S 4808, *S4820

Similarly, we are greatly encouraged by the provisions of your legislation that address the issue of government ''core'' competencies. We support the language that calls for the performance of the preponderance of this workload by private sector entities selected on the basis of competitive procedures in accordance with your narrow definition of ''core'' government competency.

The depot maintenance policy articulated in your legislation will permit the development of a logistics support program for the 21st century. Your legislation in this regard is in the national interest and in the interest of the private sector industrial base. We applaud your depot policy initiative, and offer to work closely with you in the weeks ahead to achieve its timely enactment.

Sincerely,

The Presidents of AIA, ADPA, AEA, CSA, EIA, NSIA, SCA, and the U.S. Chamber of Commerce.

Document Separator

United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Military Procurement, Committee on National Security, House of Representatives

For Release on Delivery
Expected at
2:00 p.m., EDT
Thursday,
March 16, 1995

NAVY SHIPBUILDING PROGRAMS

Nuclear Attack Submarine Requirements

Statement of Richard Davis, Director, National Security Analysis, National Security and International Affairs Division

GAO/T-NSIAD-95-120

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to be here today to discuss the requirements for continued production of nuclear attack submarines. I will summarize our two main points on this issue and then discuss the specifics.

-- First, there are less costly alternatives than the approach the Navy has chosen to maintain the required SSN force structure. As recently reported, these alternative approaches would save billions of dollars and meet the Navy's force structure and threat requirements.[1]

-- Second, the SSN-23 is not needed to satisfy force structure requirements or to counter a threat. Instead, the Department of Defense (DOD) justification for building the submarine is to preserve competition and to meet industrial base and national security needs. We believe DOD's justification is inadequate as a basis for building the SSN-23 because there currently is no competition to build nuclear attack submarines and DOD has not made clear what it means by long- term industrial base and national security needs.

BACKGROUND

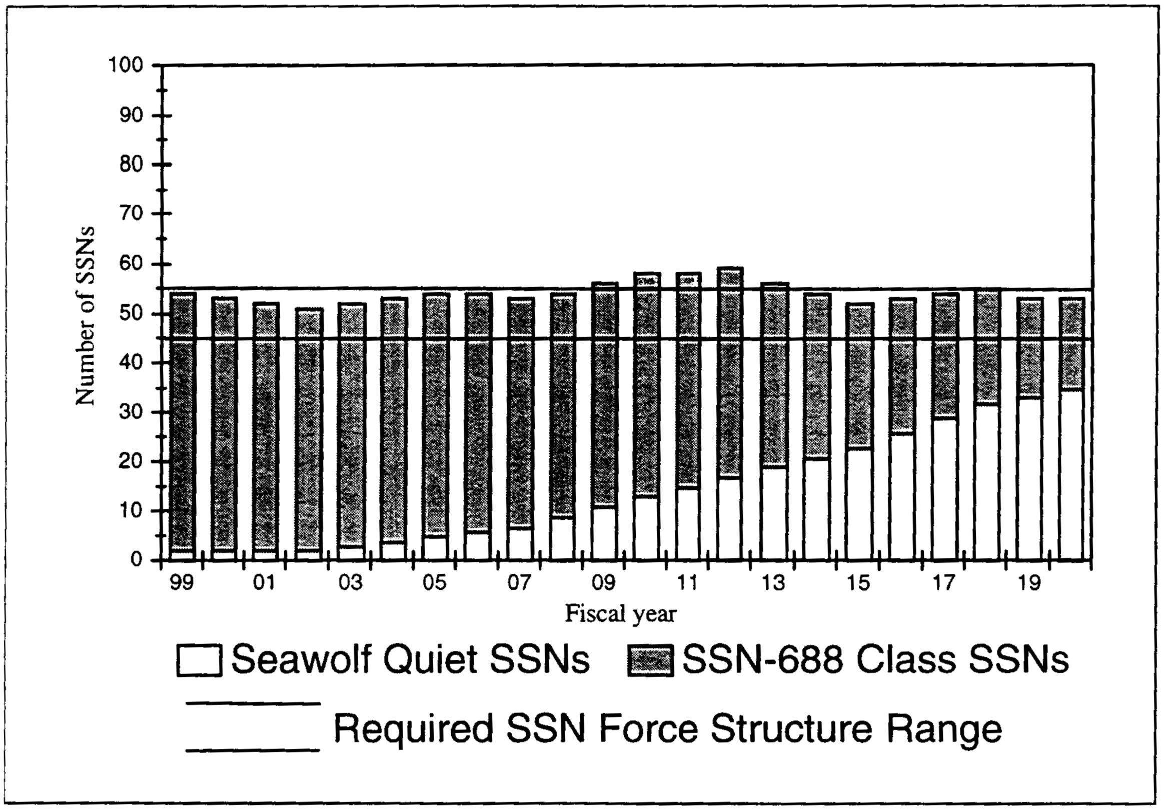
In October 1993, DOD issued its bottom-up review--an assessment of U.S. defense needs in the post-Cold War security environment. According to the report, the threat that dictated the U.S. defense strategy, doctrine, force structure, weapons, and defense budgets is gone.

As for the Navy's attack submarines, the review decided that (1) a force of 45 to 55 would be needed to meet the requirements of the U.S. defense strategy, for both regional conflicts and peacetime presence operations; (2) Electric Boat Shipyard in Groton, Connecticut, would build the third Seawolf submarine (SSN-23) to bridge the projected gap in submarine production; and (3) the Navy should develop and build a new, more cost-effective attack submarine than the Seawolf, beginning in fiscal year 1998 or 1999, at the Electric Boat Shipyard. DOD believed that with this approach, it would maintain two nuclear-capable shipyards and mitigate the risk to the industrial base.

---

[1] Attack Submarines: Alternatives for a More Affordable SSN Force Structure (GAO/NSIAD-95-16, Oct. 13, 1994).

Figure 1: Effects of Navy's SSN Shipbuilding plan on SSN Force Levels (1999-2020)



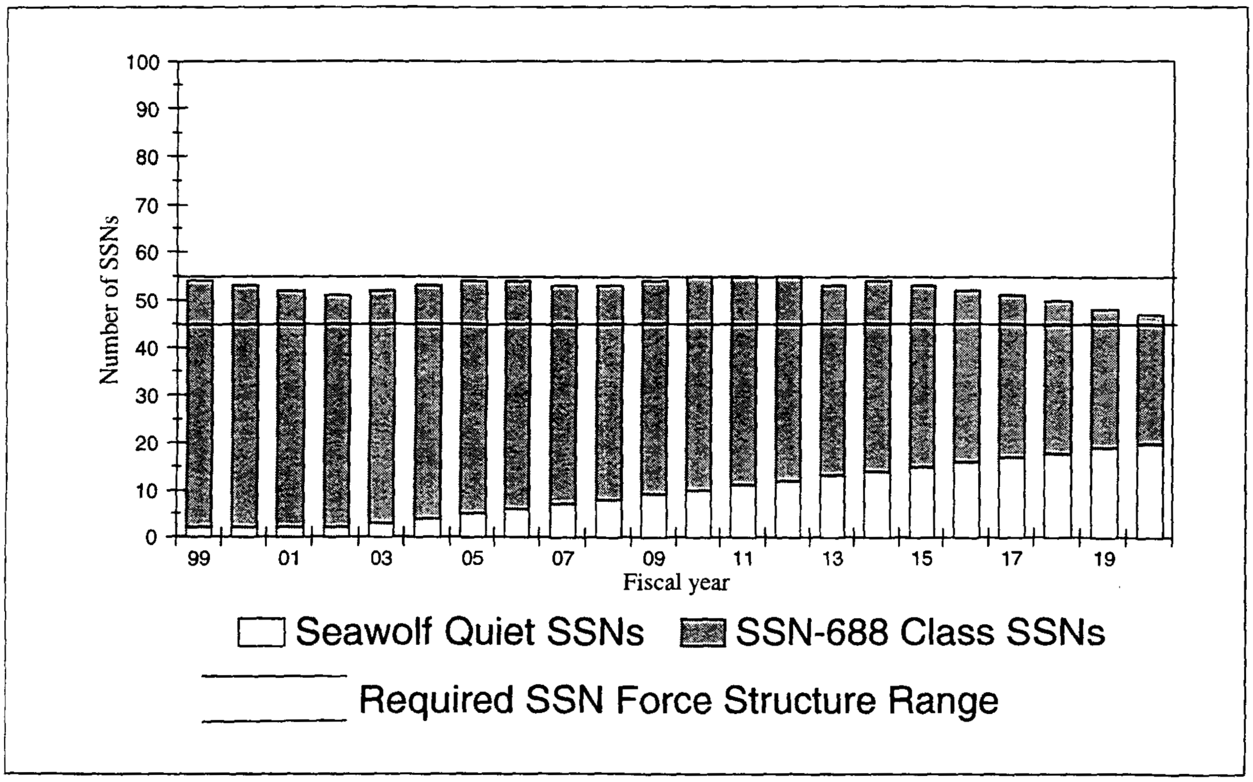
ALTERNATIVES TO THE NAVY'S SHIPBUILDING PLAN ARE LESS COSTLY AND MEET DOD'S NEEDS

In October 1994, we reported that there were less costly alternatives to the Navy's shipbuilding plan for maintaining DOD's approved attack submarine force structure of 45 to 55 submarines. Under two of the three alternatives we discussed, the Navy could maintain a sustained low-rate production, and under the third, the Navy could defer SSN construction until early in the next century.

Acquire Fewer Attack Submarines

Under one alternative, if the Navy begins to build only 25 SSNs through 2014--6 fewer than planned--it could save $9 billion in procurement costs. It could also maintain close to 55 submarines

Figure 3: Effects on SSN Force Levels of Extending the Service Life of Nine Refueled SSN-688s (1999-2020)



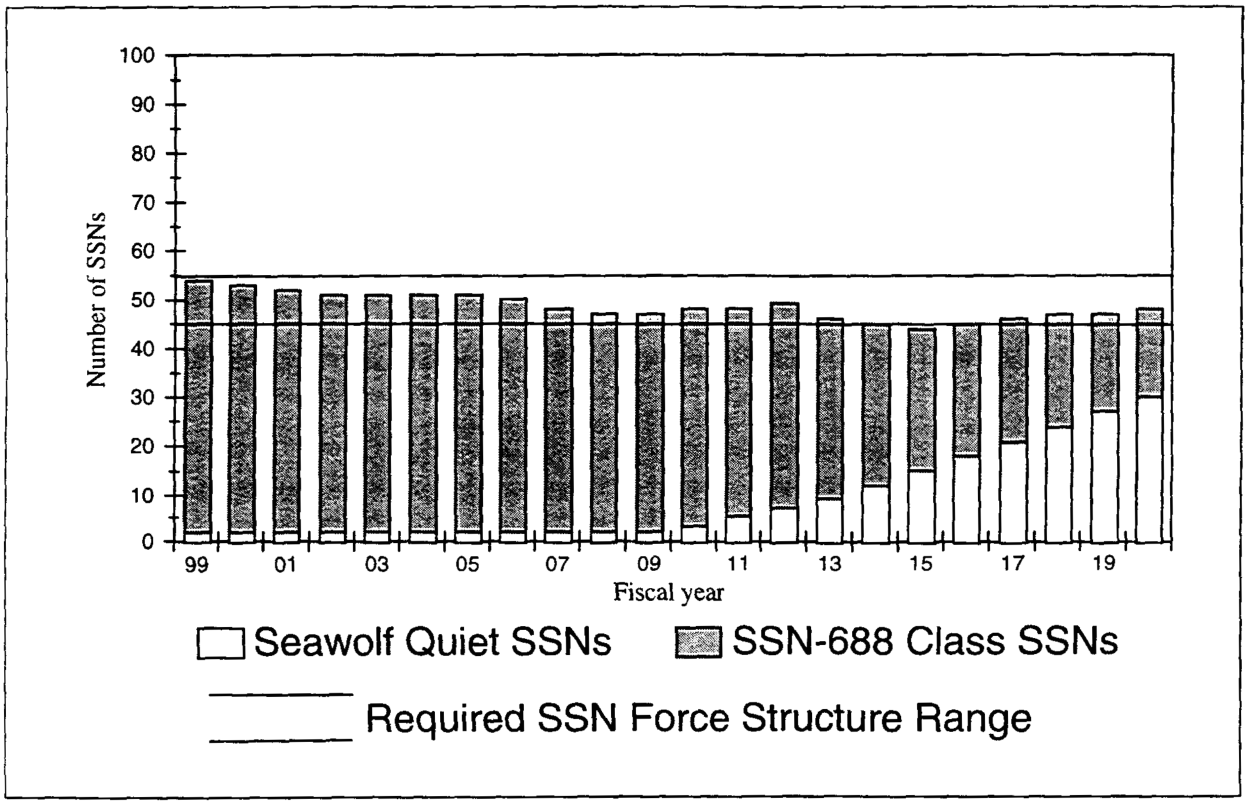
The nine refueled SSN-688s will receive nuclear cores of the same design as those installed in newer SSN-688s. With these new nuclear cores, the nine submarines will have sufficient fuel to operate for an additional 120-month operating cycle at the end of their 30-year design life. Furthermore, officials from both SSN shipbuilders stated that SSN-688 class submarines could operate for much longer than 30 years; one of the shipbuilders stated that 10 to 20 years of additional service would not be unreasonable.

Past Navy actions indicate that extending a submarine's service life may be feasible. After a 5-year study was completed on the SSN-637--the predecessor of the SSN-688--the design life was extended from 20 years to 30 years, with a possible extension to 33 years on a case-by-case basis.[2] According to Navy officials, a similar study could be the basis for extending the SSN-688's

[2]In 1989 the Navy accelerated the retirement of the SSN-637 class so that most will be retired by 27 years of service.

production base, shows that reconstitution costs are highly dependent on assumptions regarding closing, maintaining, and restarting shipbuilder facilities; hiring and retraining personnel; and shipbuilder workloads. According to the report, shipbuilder facilities and personnel reconstitution costs are estimated at $800 million to $2.7 billion.[4] The $800 million estimate is based on the Navy's beginning to build CVN-76 at Newport News Shipbuilding in 1995 and then restarting submarine production in 2003. The $2.7 billion represents RAND's estimate to restart submarine production at Electric Boat in 2003. Further, Navy officials cited a Navy industrial base study estimate of $4 billion to $6 billion for reconstitution costs, including vendor costs. Figure 4 shows the force structure implications of deferring SSN construction to 2003.

Figure 4: SSN Force Structure Under a Deferred Acquisition Scenario (1999-2020)



[4]The RAND report used fiscal year 1992 dollars.

By deferring attack submarine construction to 2003, the Navy would not have 10 to 12 Seawolf quiet submarines before 2014.

Now let me turn to the recent Office of Naval Intelligence report, "Worldwide Submarine Proliferation in the Coming Decade," which discusses improvements in and growing numbers of foreign submarines. According to the report, Russia's frontline submarines are for the first time, as quiet or quieter in some respects than the SSN-688Is and Russia plans to continue reducing radiated noise on its submarines.

However, the report does not address other factors that should be considered to determine the overall superiority of U.S. and Russian submarines, such as sensor processing, weapons, platform design, tactics, doctrine, and training. This omission is significant since, according to the Navy, it is essential that these factors be considered in addition to acoustic quieting to determine the overall qualitative advantage of U.S. versus Russian submarines.

Public reports, news accounts, and more importantly other DOD publications--including the annual Director of Naval Intelligence Posture Statement--present information on some of the other factors that affect submarine superiority. These reports note a decline in Russian submarines' operating tempos, order of battle, and construction programs. They also note that morale and discipline have deteriorated, personnel shortages are serious, and the frequency and scope of naval operations, training, readiness, and maintenance have declined.

It is also important to note that the intelligence community disagrees about the course of the future Russian submarine threat. For example, based on our preliminary work, we are aware of differences within the community concerning such issues as Russia's defense spending priorities, Russia's ability to maintain its production schedules, and future threat scenarios.

BUILDING SSN-23 FOR INDUSTRIAL BASE REASONS HAS NOT BEEN JUSTIFIED

DOD decided to build the SSN-23 in 1996 and commence with new SSN construction in 1998 at Electric Boat to support the nuclear shipbuilding industrial base. The United States has two builders of nuclear ships: Electric Boat, which builds submarines, and Newport News Shipbuilding, which builds aircraft carriers and submarines. In its bottom-up review, DOD considered several options to avoid the potential consequences of a gap in submarine construction. A key option considered was the consolidation of

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 6015
Gaithersburg, MD 20884-6015

or visit:

Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000
or by using fax number (301) 258-4066, or TDD (301) 413-0006.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (301) 258-4097 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

Document Separator

United States General Accounting Office

GAO

Testimony

Before the Subcommittee on Military Procurement, Committe on National Security, House of Representatives

For Release on Delivery
Expected at
2:00 p.m., EDT
Thursday,
March 16, 1995

NAVY SHIPBUILDING PROGRAMS

Nuclear Attack Submarine Requirements

Statement of Richard Davis, Director, National Security Analysis, National Security and International Affairs Division

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to be here today to discuss the requirements for continued production of nuclear attack submarines. I will summarize our two main points on this issue and then discuss the specifics.

-- First, there are less costly alternatives than the approach the Navy has chosen to maintain the required SSN force structure. As recently reported, these alternative approaches would save billions of dollars and meet the Navy's force structure and threat requirements.[1]

-- Second, the SSN-23 is not needed to satisfy force structure requirements or to counter a threat. Instead, the Department of Defense (DOD) justification for building the submarine is to preserve competition and to meet industrial base and national security needs. We believe DOD's justification is inadequate as a basis for building the SSN-23 because there currently is no competition to build nuclear attack submarines and DOD has not made clear what it means by long- term industrial base and national security needs.

---

[1]Attack Submarines: Alternatives for a More Affordable SSN Force Structure (GAO/NSIAD-95-16, Oct. 13, 1994).

BACKGROUND

In October 1993, DOD issued its bottom-up review--an assessment of U.S. defense needs in the post-Cold War security environment. According to the report, the threat that dictated the U.S. defense strategy, doctrine, force structure, weapons, and defense budgets is gone.

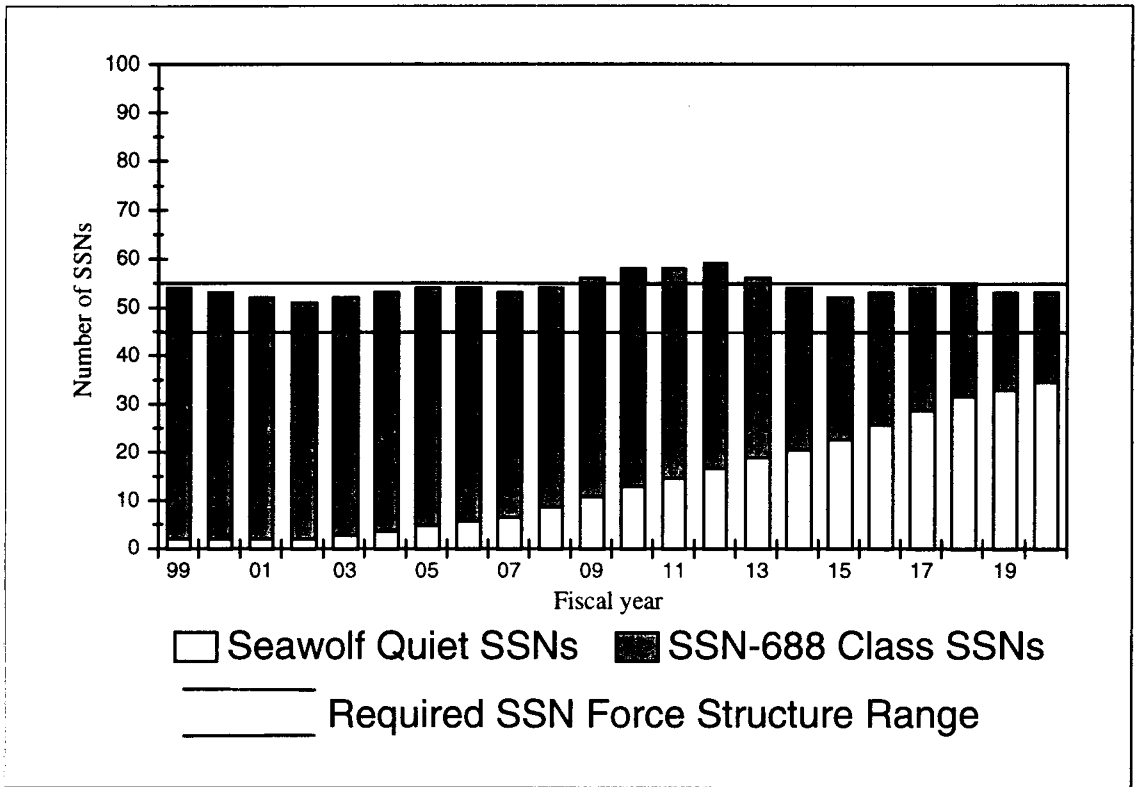
As for the Navy's attack submarines, the review decided that (1) a force of 45 to 55 would be needed to meet the requirements of the U.S. defense strategy, for both regional conflicts and peacetime presence operations; (2) Electric Boat Shipyard in Groton, Connecticut, would build the third Seawolf submarine (SSN-23) to bridge the projected gap in submarine production; and (3) the Navy should develop and build a new, more cost-effective attack submarine than the Seawolf, beginning in fiscal year 1998 or 1999, at the Electric Boat Shipyard. DOD believed that with this approach, it would maintain two nuclear-capable shipyards and mitigate the risk to the industrial base.

DOD's report on its bottom-up review states that before it decided on a force of 45 to 55 attack submarines, detailed analyses of various options were performed by the Joint Staff, the Navy, and the Office of the Secretary of Defense. The analyses of a 55 submarine force indicate that it would meet all wartime requirements for regional conflicts, as well as fulfill peacetime needs. The analyses of a 45 submarine force indicate that it could also fulfill wartime requirements, but it imposes a greater degree of risk to peacetime operations than a 55 SSN force.

To reduce its SSN force of about 85 submarines to the maximum of 55 by 1999, the Navy plans to retire its pre-SSN-688 class submarines and 10 of its older SSN-688s, while taking delivery of the 7 SSN-688Is and 2 Seawolf class submarines currently under construction. The 10 SSN-688s will be retired at about the midpoint of their 30-year design life, or the time a refueling overhaul would be required; therefore, each of these submarines will have as much as 14 years of their design service life remaining. The Navy believes that retiring the SSN-688s prior to their mid-life refueling is the lowest cost means of reducing the SSN force.

To maintain an SSN force of 45 to 55 submarines, the Navy plans to begin building 31 SSNs between 1996 and 2014 at an estimated procurement cost of $48 billion. This approach allows the Navy to maintain an SSN force structure close to the maximum of 55 SSNs through 2020 (see Figure 1).

Figure 1: Effects of Navy's SSN Shipbuilding plan on SSN Force Levels (1999-2020)



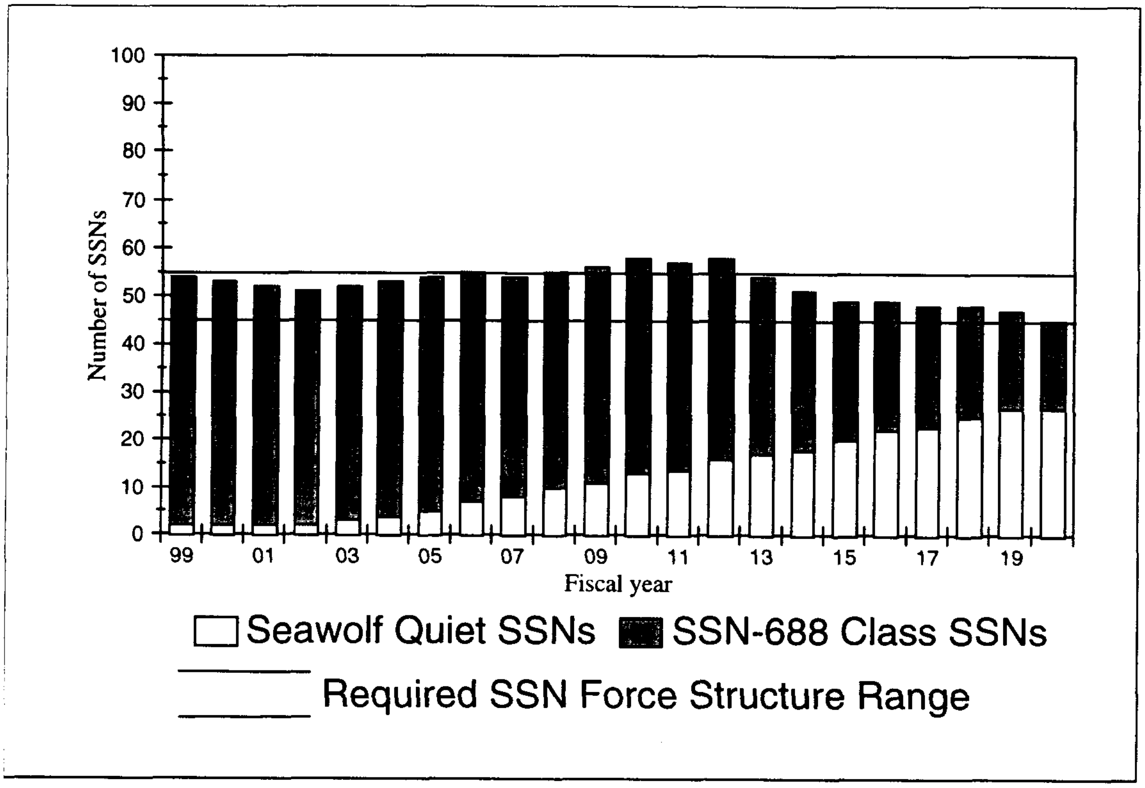
ALTERNATIVES TO THE NAVY'S SHIPBUILDING PLAN ARE LESS COSTLY AND MEET DOD'S NEEDS

In October 1994, we reported that there were less costly alternatives to the Navy's shipbuilding plan for maintaining DOD's approved attack submarine force structure of 45 to 55 submarines. Under two of the three alternatives we discussed, the Navy could maintain a sustained low-rate production, and under the third, the Navy could defer SSN construction until early in the next century.

Acquire Fewer Attack Submarines

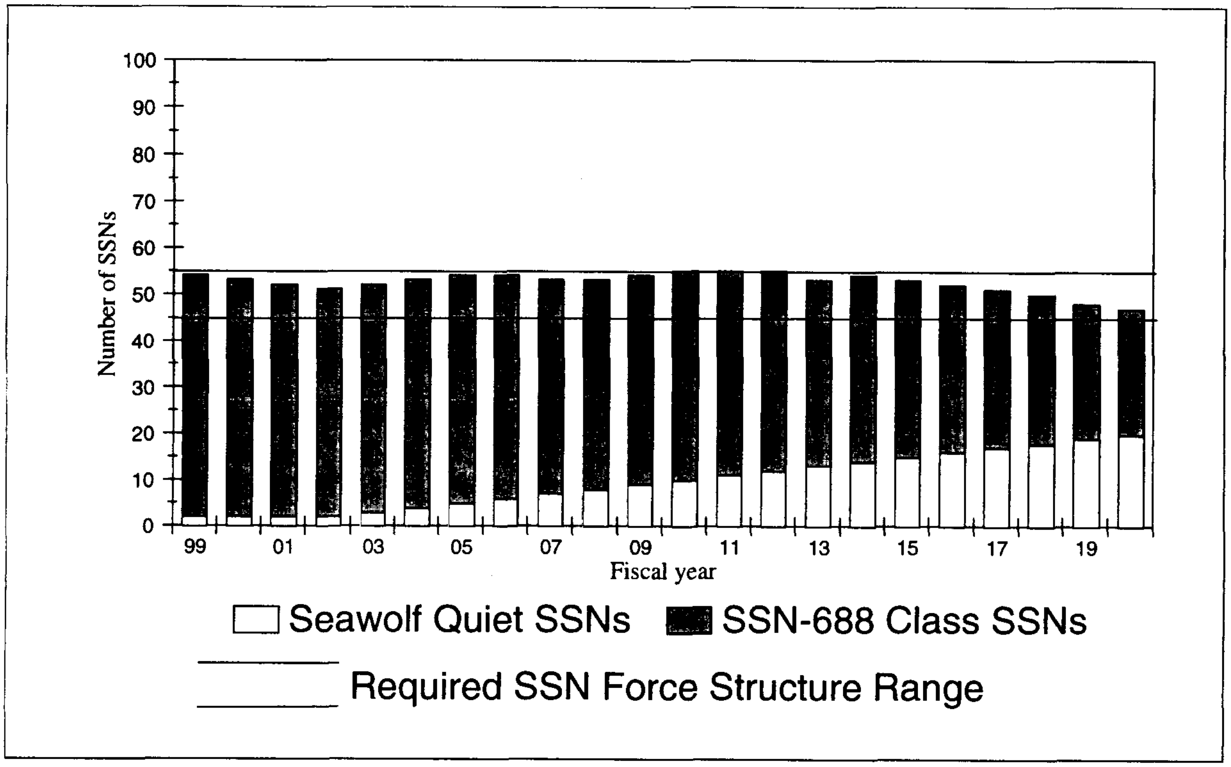
Under one alternative, if the Navy begins to build only 25 SSNs through 2014--6 fewer than planned--it could save $9 billion in procurement costs. It could also maintain close to 55 submarines through 2013, before declining to 45 SSNs in 2020 (see figure 2). This alternative would never require funds for more than two SSNs per year through 2014. Beyond 2014, this alternative would require managed procurement of no more than three SSNs per year.

Figure 2: SSN Force Level Projections Through 2020 if the Navy Buys 25 SSNs Through 2014 (1999-2020)



Under a second alternative, the Navy could extend the service life of 9 refueled SSN-688s and buy 14 fewer submarines than currently planned. This approach saves about $17 billion in procurement costs after accounting for the third overhaul of 9 submarines. This alternative also allows the Navy to maintain a force structure of 45 to 55 submarines (see figure 3).

Figure 3: Effects on SSN Force Levels of Extending the Service Life of Nine Refueled SSN-688s (1999-2020)



The nine refueled SSN-688s will receive nuclear cores of the same design as those installed in newer SSN-688s. With these new nuclear cores, the nine submarines will have sufficient fuel to operate for an additional 120-month operating cycle at the end of their 30-year design life. Furthermore, officials from both SSN shipbuilders stated that SSN-688 class submarines could operate for much longer than 30 years; one of the shipbuilders stated that 10 to 20 years of additional service would not be unreasonable.

Past Navy actions indicate that extending a submarine's service life may be feasible. After a 5-year study was completed on the SSN-637--the predecessor of the SSN-688--the design life was extended from 20 years to 30 years, with a possible extension to 33 years on a case-by-case basis.[2] According to Navy officials, a similar study could be the basis for extending the SSN-688's service life. Navy officials said, however, that (1) it would be premature to begin a study before 1998 at the earliest, when the SSN-688s near the end of their design life, and (2) the Navy plans no such study of the SSN-688. The Navy has begun to study an extension from 30 to 40 years of the service life of its Nuclear-Powered Ballistic Missile Submarine (SSBN)-726 Ohio class (Trident) submarine, which entered the fleet 5 years later than the SSN-688.

DeMars says this would take many years

Defer Attack Submarine Construction

Under a third alternative, the Navy could defer new SSN construction. In February 1994, the Secretary of Defense testified that DOD has no force structure need to build new submarines until after the turn of the century. New SSN construction can be deferred because the Navy can maintain the minimum 45 SSN force structure with its current fleet until 2012.

---

[2]In 1989 the Navy accelerated the retirement of the SSN-637 class so that most will be retired by 27 years of service.

A deferral of new construction can free up billions of dollars in planned construction costs in the near term. As an illustration of the potential for deferring SSN construction, we analyzed an alternative in which construction is deferred until 2003. We assumed that construction of the submarines would take 5 years, which is how long the Navy estimates new attack submarine construction will take. However, we lengthened construction time for the first two SSNs to 7 and 6 years, respectively, to account for the additional time needed to build the first submarine of a class and any extra effort required to restart production after a hiatus. We believe that using 7 and 6 years is reasonable because RAND recently reported[3] that 6 years would be required to deliver the first submarine after restarting submarine production at Newport News Shipbuilding, assuming construction of the funded aircraft carrier, CVN-76. Although SSN unit costs would vary based on the number of SSNs bought, we used the same procurement costs as the Navy's current estimates for the new attack submarine program.

Compared to the Navy's September 1993 SSN shipbuilding plan, this alternative would save about $9 billion in procurement costs through 2014. Also, this alternative defers as much as $9

---

[3] The U.S. Submarine Production Base: An Analysis of Cost, Schedule, and Risk for Selected Force Structures, RAND (Santa Monica, CA., 1994).

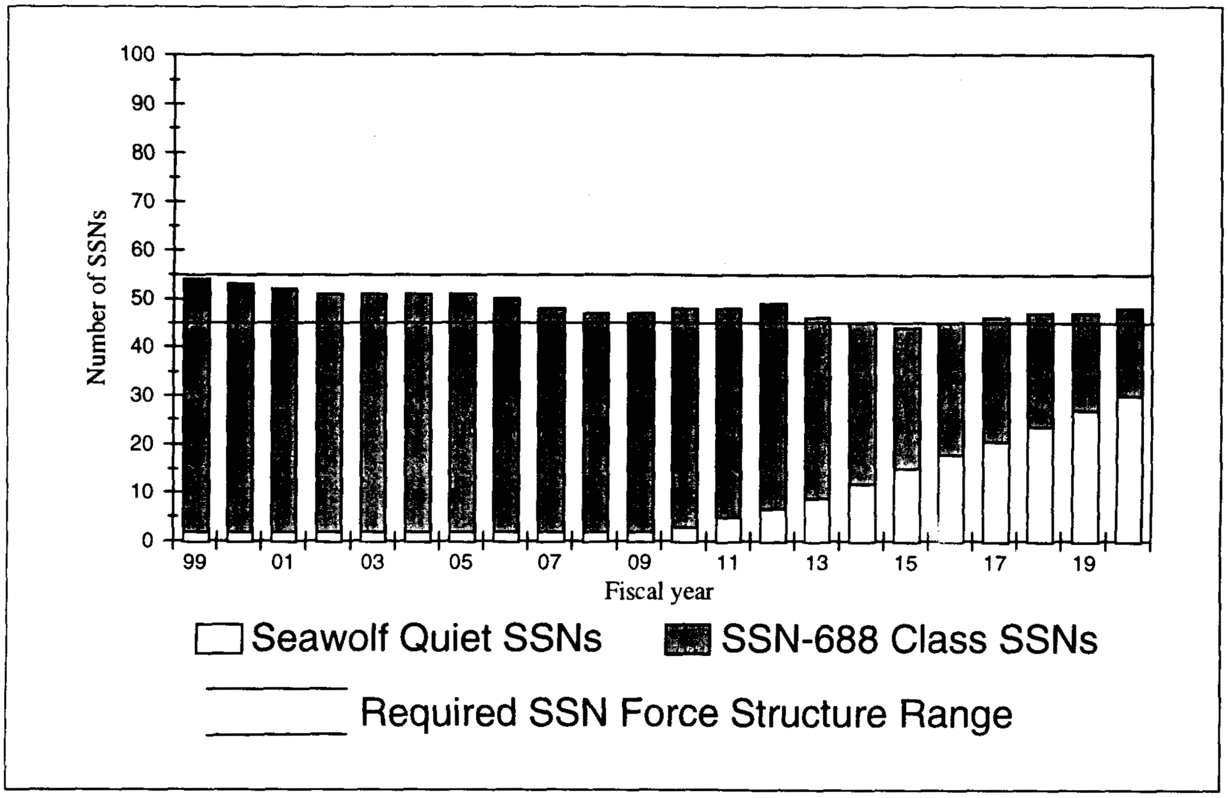
Requested

billion in planned SSN construction funding from 1996 to 2002. However, savings would be offset by reconstitution costs.

The 1994 RAND report, which evaluated the U.S. submarine production base, shows that reconstitution costs are highly dependent on assumptions regarding closing, maintaining, and restarting shipbuilder facilities; hiring and retraining personnel; and shipbuilder workloads. According to the report, shipbuilder facilities and personnel reconstitution costs are estimated at $800 million to $2.7 billion.[4] The $800 million estimate is based on the Navy's beginning to build CVN-76 at Newport News Shipbuilding in 1995 and then restarting submarine production in 2003. The $2.7 billion represents RAND's estimate to restart submarine production at Electric Boat in 2003. Further, Navy officials cited a Navy industrial base study estimate of $4 billion to $6 billion for reconstitution costs, including vendor costs. Figure 4 shows the force structure implications of deferring SSN construction to 2003.

[4]The RAND report used fiscal year 1992 dollars.

Figure 4: SSN Force Structure Under a Deferred Acquisition Scenario (1999-2020)

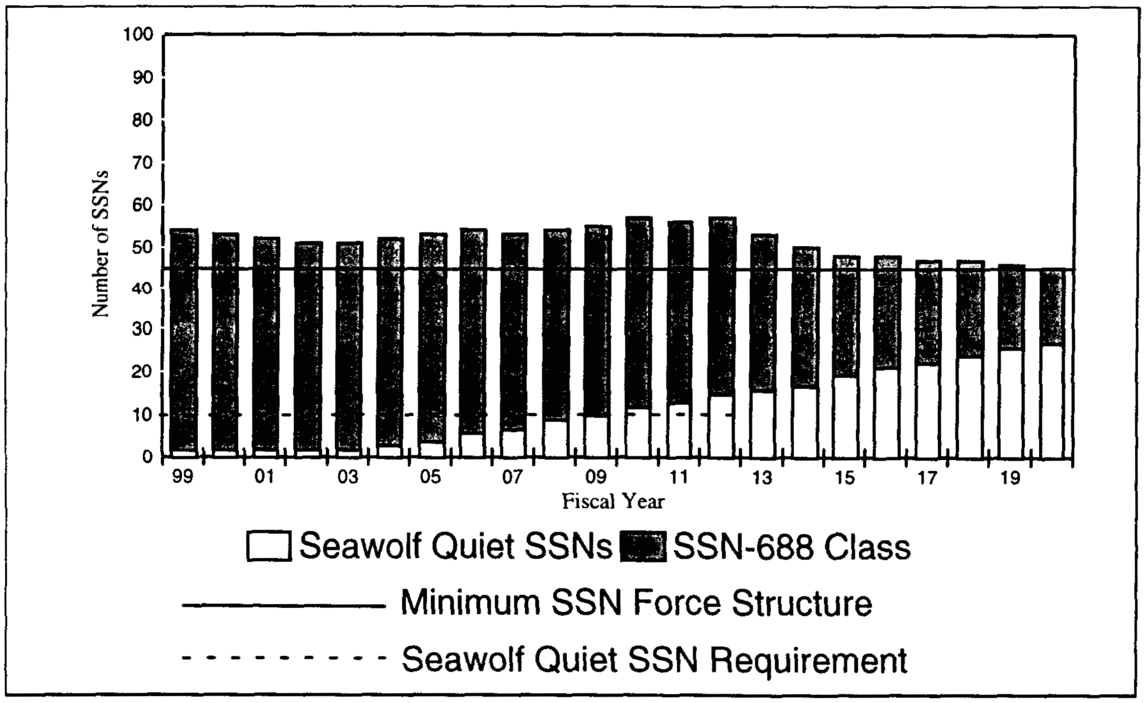


These three alternatives demonstrate that the Navy can maintain its approved force levels by acquiring fewer than 31 SSNs through 2014 as currently planned. Furthermore, if the Navy defers construction to 2003 it would not build the third Seawolf in 1996. The Navy could still achieve its approved force levels without building the third Seawolf if it chose either one of the first two alternatives by either consolidating submarine construction at Newport News Shipbuilding or finding another way to bridge the production gap at Electric Boat.

ALTERNATIVES TO THE NAVY'S SHIPBUILDING PLAN CAN MEET THE SUBMARINE THREAT

The Navy wants 10 to 12 submarines as quiet as the Seawolf by 2012 for the anti-SSBN and presence missions anticipated in that time frame. By implementing either of our first two alternatives, the Navy can have 10 to 12 Seawolf quiet submarines by 2012 without building the third Seawolf. If the Navy does not buy the SSN-23 and builds 24 new attack submarines, it can maintain its minimum force level and exceed its goal for Seawolf quiet submarines (see figure 5).

Figure 5: SSN Force Structure Without SSN-23 and 24 New Attack Submarines (1999-2020)



By deferring attack submarine construction to 2003, the Navy would not have 10 to 12 Seawolf quiet submarines before 2014.

Now let me turn to the recent Office of Naval Intelligence report, "Worldwide Submarine Proliferation in the Coming Decade," which discusses improvements in and growing numbers of foreign submarines. According to the report, Russia's frontline submarines are for the first time, as quiet or quieter in some respects than the SSN-688Is and Russia plans to continue reducing radiated noise on its submarines.

However, the report does not address other factors that should be considered to determine the overall superiority of U.S. and Russian submarines, such as sensor processing, weapons, platform design, tactics, doctrine, and training. This omission is significant since, according to the Navy, it is essential that these factors be considered in addition to acoustic quieting to determine the overall qualitative advantage of U.S. versus Russian submarines.

So true!

Public reports, news accounts, and more importantly other DOD publications--including the annual Director of Naval Intelligence Posture Statement--present information on some of the other factors that affect submarine superiority. These reports note a decline in Russian submarines' operating tempos, order of battle, and construction programs. They also note that morale and discipline have deteriorated, personnel shortages are serious, and the frequency and scope of naval operations, training, readiness, and maintenance have declined.

It is also important to note that the intelligence community disagrees about the course of the future Russian submarine threat. For example, based on our preliminary work, we are aware of differences within the community concerning such issues as Russia's defense spending priorities, Russia's ability to maintain its production schedules, and future threat scenarios.

BUILDING SSN-23 FOR INDUSTRIAL BASE REASONS HAS NOT BEEN JUSTIFIED

DOD decided to build the SSN-23 in 1996 and commence with new SSN construction in 1998 at Electric Boat to support the nuclear shipbuilding industrial base. The United States has two builders of nuclear ships: Electric Boat, which builds submarines, and Newport News Shipbuilding, which builds aircraft carriers and submarines. In its bottom-up review, DOD considered several options to avoid the potential consequences of a gap in submarine construction. A key option considered was the consolidation of all carrier and submarine construction at one shipyard. DOD reported that, under this option, $1.2 billion would be saved after accounting for about $625 million in shutdown and reconstitution costs from fiscal years 1995 through 1999. DOD rejected this option because of its concern about the resulting loss of competition and other long-term defense industrial base and national security needs.

In April 1994, we testified that DOD had not provided the basis for its position.[5] It was not clear what DOD meant by "loss of competition." For example, only one shipyard currently builds nuclear aircraft carriers, but DOD has not expressed concern about lack of competition in that program. Moreover, DOD has directed future nuclear submarine work to be done at the other nuclear-capable shipyard, virtually eliminating competition. It is not clear why DOD determined that two nuclear-capable shipyards are needed to protect "the long-term defense industrial base and national security."

Mr. Chairman, this concludes my prepared remarks. I would be happy to answer any questions you may have.

---

[5]Navy Modernization: Alternatives for Achieving a More Affordable Force Structure (GAO/T-NSIAD-94-171, Apr. 26, 1994).

 On-hand

NOT FOR PUBLICATION UNTIL RELEASED BY THE
HOUSE NATIONAL SECURITY COMMITTEE
PROCUREMENT SUBCOMMITTEE

STATEMENT OF

THE HONORABLE NORA SLATKIN

ASSISTANT SECRETARY OF THE NAVY

(RESEARCH, DEVELOPMENT AND ACQUISITION)

BEFORE THE

SUBCOMMITTEE ON PROCUREMENT

OF THE

HOUSE NATIONAL SECURITY COMMITTEE

ON THE

FY 1996 NAVY SUBMARINE MODERNIZATION PLAN

MARCH 16, 1995

NOT FOR PUBLICATION UNTIL RELEASED BY THE
HOUSE NATIONAL SECURITY COMMITTEE
PROCUREMENT SUBCOMMITTEE

THE HONORABLE NORA SLATKIN
Assistant Secretary of the Navy
Research, Development & Acquisition

As the Assistant Secretary of the Navy for Research, Development and Acquisition, Nora Slatkin is the Department's Acquisition Executive responsible for all research, development and procurement of defense systems satisfying the requirements of the Navy and Marine Corps. She is also responsible for all acquisition policy and procedures within the Department.

Prior to being nominated and confirmed as the Assistant Secretary of the Navy she was assigned as Special Assistant to the Under Secretary of Defense for Acquisition. In this capacity she was involved in defense acquisition program oversight and policy development on a Department of Defense wide basis.

From December 1984 to January 1993 she was a member of the professional staff of the House Armed Services Committee where she served as the lead staff member of the Subcommittees on Procurement and Military Nuclear Systems.

For seven years prior to joining the professional staff of the House Armed Services Committee Ms. Slatkin was the principal defense analyst with the Congressional Budget Office for ground force issues. In addition she has worked as a graduate fellow at the National Security Council, the Department of State and the Central Intelligence Agency.

Ms. Slatkin is a Phi Beta Kappa graduate of Lehigh University (1977) with a degree in International Relations and holds a Master of Science degree in Foreign Service from Georgetown University (1979). She has also attended the Harvard University Program for Senior Executives in National and International Security (1990).

Ms. Slatkin was born in Glen Cove, New York on May 5, 1955. She and her husband, Deral Willis, reside in Annapolis, Maryland.

Mr. Chairman, distinguished members of the House National Security Committee, thank you for this opportunity to appear before you to discuss the Department of the Navy's Submarine Program and Fiscal year 1996 budget request.

In my testimony today I will make three main points:

First, the changes brought by the end of the Cold War mean significant changes for our attack submarine program. We must maintain undersea superiority, but we are putting new emphasis on a variety of missions to deal with the demands of this new era.

Second, we have the right platform for the future with our smaller, more affordable but very capable New Attack Submarine. The application of technology to reduce cost, and the emphasis on flexibility and modularity to adapt to new missions mark a significant change in focus from our past Cold War priorities.

Third, we face a near-term decision on a production bridge to move us from where we are today to where we need to be to begin production of our New Attack Submarine. We have exhaustively examined this issue in studies within the department and without. Our analysis shows us that one solution gives us both the best return on our money and allows us to best prepare for the future. That solution is using construction of the SSN23 as the production bridge to the New Attack Submarine.

To support these points in detail, Mr. Chairman, I have divided my testimony into three main parts. First our mission requirements; second, our New Attack Submarine program, and third, the important near-term decisions for submarine recapitalization.

I. THREAT AND MISSION REQUIREMENTS

Why Submarines?

Before discussing the specifics of the submarine recapitalization and modernization plan it is worthwhile to review the value of submarines. Why do we need them? What do they do?

Their most enduring characteristic is STEALTH. As in any form of warfare, the ability to remain undetected or camouflaged from the enemy is of prime importance. Today, and perhaps more so in the future, submarine STEALTH will translate into two major warfare enhancements.

role they play for joint forces as they covertly prepare the littoral battlespace for the entry of follow-on forces.

The Uncertain Russian Threat

The entire Russian military has been affected by dire economic conditions. However, within the Russian Navy the submarine force has been far less affected than the surface force. Their submarine research, development and construction programs remain aggressive. We cannot afford to lose sight of this reality as we concentrate on regional conflicts and third world capabilities. Without implying sinister intent or purpose on their part, we, as a maritime nation, should remain committed to not ceding undersea superiority to any other power.

Out of area Russian submarine activity is lower than Cold War levels. However, a recent demonstration of Russian submarine potential occurred in July 1994. An OSCAR anti-ship missile submarine left its home waters and intercepted two US Carrier Battle Groups operating in the Western Pacific. This episode reflects a Russian desire to maintain a world class submarine force. The ultimate future of the force will depend on economic recovery, the Russian Navy's claims on defense resources, and the out come of the Russian debate over the future of the nuclear triad.

As other nations develop submarine expertise, incidents such as this are likely to occur. Nations with nuclear submarines are capable of interdicting shipping on the open seas while those with conventional submarines can deny freedom of navigation through geographic choke points and transit lanes in proximity to their shores.

Russian Submarine Quality Improves

Russia has placed a national priority on quality submarine forces - both attack and ballistic missile - retaining a formidable force of over 180 capable nuclear and diesel submarines today and projected to be building toward a quality force of 20 ballistic missile submarines, 60 nuclear attack submarines (including 14 SSGNs) and 40 diesel submarines by early in the next decade.

With increasing dependence on the submarine force for executing their nuclear missile strategy, the Russian commitment to develop the most advanced technologies in their submarines continues unabated. Their national resolve to field highly capable attack submarines hinges on this national policy. The Russians frequently deploy their SSNs required. This unique warfighting asset prepares the battlespace to enable the flow of follow-on forces.

Force Levels and the Need to Restart Production NOW

The Department of Defense position is to maintain a force level of 45-55 attack submarines. The Joint Chiefs of Staff have mandated that 10-12 submarines have SEAWOLF like stealth by the year 2012.

No U.S. submarine has been authorized for construction since 1991.

This creates a challenge of maintaining the required force level in a era of rapidly declining budget resources with an unprecedented gaps in the construction of nuclear attack submarines.

We need to achieve a continuous and efficient submarine production rate by 2002 in order to sustain the required SSN force levels. Starting in 2011 our remaining 688s will reach the end of their service life at a rate of 3 to 4 per year. Given the time span to construct a submarine coupled with the fact that future build rates will be at a low rate of production -- we must begin building the new class of submarine as soon as we can -- 1998. Reaching low rate production by the turn of the century will satisfy vital military requirements and sustain our ability to build submarines - affordably.

II. NEW ATTACK SUBMARINE (used to be called Centurion)

Why a New Class of Submarines?

Two distinct streams of thought converged to establish the requirement for a new submarine design:

- First, the anticipated demise of the Russian Navy called into question the need for SEAWOLF class submarines. The SSN-21 was perceived to possess excess military capability in light of the projected post-Cold War security environment. The Navy revised its submarine recapitalization efforts toward developing a lower cost alternative for SEAWOLF. Simply stated, the Navy needs a submarine that can be built in adequate numbers to sustain submarine force levels well into the next century. "Surplus Capability" had to be traded for cost.

- Second, the dominant threat over the past four decades has been the Soviet Union. That threat concentrated submarine performance toward only two of

The need for greater military capability and flexibility must be satisfied at the lowest possible cost.

New Attack Submarine -- Littoral Warfare Performance

The New Attack Submarine is the first nuclear submarine designed to focus on the spectrum of missions rather than emphasizing Cold War priorities. For operations in potentially mined and shallow waters, the new submarine will incorporate a system that reduces its magnetic signature. Its mast arrangement and torpedo room will be reconfigurable so that they can be altered to conform to specific missions. Incorporating a fiber optic "periscope", called a Photonics Mast, provides improved night vision, enhanced image recognition, improved threat recognition and a laser range finder. It will also be constructed with a Special Forces exit and entry chamber. It will be capable of carrying underwater vehicles designed to deliver Navy Seals or Marine Recon Forces.

An "open systems" commercialized electronics architecture, facilitating the use of Commercial Off the Shelf Systems, ensures that New Attack Submarine will remain in step with the electronics revolution. While remaining the "silent service", this submarine will be connected with all Naval and Joint communications networks.

Lastly, engineering developments in the propulsion plant contribute to the New Attack Submarine's total mission performance. Stealth is the enabling capability that allows the submarine:

- to maintain tactical advantage
- to enjoy unimpeded access to critical waters
- to avoid confrontation when appropriate
- to covertly observe the adversary

New Attack Submarine and Affordability

In addition to the military requirements that drove the design of the New Attack Submarine, affordability has been a major focus since the work began. Once the military requirements were established and validated, affordable production and life cycle support assumed center stage.

Major cost reductions have been realized through producibility initiatives such as simplification, the use of more commercial items and integrating the efforts of design and build teams.

This New Attack Submarine, with all its enhanced capabilities, will cost far less than producing SEAWOLF in a new construction starts since 1991. We are clearly in a transition period from high rate to low rate production. We need a method to "bridge" this gap. There are six key elements to be considered in any bridge solution:

1. Design of complex, vendor-supplied non-nuclear components,

2. Production of complex, vendor-supplied non-nuclear components,

3. Design of nuclear components,

4. Production of nuclear components,

5. Design of nuclear submarines,

6. Construction of nuclear submarines.

The issue was examined in a number of ways, including studies by the Navy, the Joint Staff and the Office of the Secretary of Defense, as well as an independent examination of the issues by the RAND Corporation.

The conclusions drawn by all of these studies are essentially the same, i.e. additional SSN construction is essential to "bridging" submarine production from 1991 (last nuclear submarine new construction authorization) to the planned authorization of the New Attack Submarine in 1998. The gap, without SSN construction, would have a devastating impact on an industry which, of necessity, is dedicated to design and construction of nuclear submarine components and has little or no offsetting, parallel commercial work.

Construction of the SSN23 at the Groton builder was determined to be the most time- and cost-efficient solution. This decision was taken only after a thorough examination of alternatives and provides clear benefits for the Navy and the nation.

Alternatives for Bridging the Gap

1. Shutdown of the Industrial Base until 1998 or later

Nuclear capable shipbuilders represent a collection of skills that are difficult to establish but quick to perish. We have never attempted a shutdown and restart of a nuclear capable shipyard. It would be safe to say that such an exercise would be of very high risk and there is no guarantee that we would ever be able to recover the capability. Additionally, the impact of any protracted gap is felt at the component supplier level as well.

production to support one or two ships, would be expensive and inefficient, as would reinvesting in some of the older technologies which have been overtaken by SEAWOLF technologies.

Construction of SSN 23

Construction of SSN 23 provides the most cost-effective solution to sustaining the nuclear submarine design and construction capability. This approach has the near term added benefit of providing the nation with a third state-of-the-art SEAWOLF submarine.

The authorization of SSN23 takes advantage of the $900 million of SSN23 specific long lead materials previously authorized.

Authorization of SSN 23 and low rate production of New Attack Submarines, beginning with the lead ship in 1998, provides the necessary workload to maintain critical construction and design skills through this decade. Other alternatives considered simply do not possess the workload nor require the right mix of skills to adequately bridge the gap.

Why SSN 23?

The case for SSN 23 as a bridge submarine is compelling from the perspective of its value added in terms or warfighting capability, its preservation of key industrial base components and the sense it makes from an economic perspective when compared to other alternatives.

The SEAWOLF class submarine not only addresses all current warfighting needs, but introduces capabilities and technologies that are lacking in today's forces. With its superior speed and payload, the SEAWOLF is ideally suited to deliver a rapid and decisive military response. The acoustic quieting achieved in this ship will preserve U.S. dominance of the undersea battlespace that has been increasingly challenged by the advanced, high quality submarines still being built by the former Soviet Union. Acknowledging this threat, the Joint Staff has called for 10-12 submarines of SEAWOLF level quieting by 2012. In addition to quieting, SEAWOLF provides a reduced magnetic signature, making it less susceptible to mines and shallow water detection, improved electronics surveillance capabilities and the next generation sonar suite; all of which contribute to the missions assigned today and expected tomorrow. SEAWOLF can do every mission better than 688I.

Building the third SEAWOLF also represents a responsible fiscal decision. Prior to terminating the SEAWOLF class and during the subsequent period of program restructuring, approximately $380 million of SEAWOLF class components were to the New Attack Submarine at the Groton, CT shipyard with lead ship construction commencing in 1998.

Detouring from completing SSN23 would cost the Government roughly $700M to $1.0B plus potential intangible costs that could be hundreds of millions of dollars. These cost are increased costs to the current SEAWOLF and TRIDENT programs as well as the New Attack Submarine program. They are all unbudgeted costs.

The rough estimate of Government liability in each area (in then year $) is:

Existing contracts	$205M - $360M
New Attack Submarine	$510M - $670M
Potential Other costs	Unknown (potentially 100s of $millions)

o **Existing Contracts**. Because there have been no submarine starts since 1991, shipbuilder workload is dramatically declining. Without SSN 23, overhead/indirect cost allocations would increase for the shipbuilder's remaining contracts. Specifically:

-- The overhead rates, estimates at completion and budgets relating to all the shipbuilder's existing contracts presume SSN 23 will absorb a substantial share of the shipbuilder's overhead.. Deletion of SSN 23 would cause overhead, to be allocated (via higher overhead rates) among remaining contracts. Moreover, additional indirect costs such as construction facility/equipment lay-up costs and unallocated material cost would be charged to existing contracts.

-- Higher overhead rates also would result in increased costs to Navy on its engineering and design contracts, which are cost type contracts for which Navy pays all allowable and allocable costs. These contracts represent about half the work to be performed by the shipbuilder for the rest of the decade.

o **New Attack Submarine**. Deletion of SSN 23 would cause overhead, which otherwise would be borne by SSN 23 in FY98 to FY02, to be allocated to the New Attack Submarine (via a higher overhead rate). More importantly, without SSN 23 in FY 96, the Navy would lose -- and then try to reconstitute -- critical capabilities essential to constructing the New Attack Submarine in FY 1998, e.g., skilled tradesmen, unique construction facilities, and key submarine component suppliers. The New Attack Submarine would bear the cost of restarting or sustaining these capabilities.

Any potential downsizing to a single yard must also be evaluated in terms of the capabilities we lose. Those include:

- o TRIDENT/SEAWOLF design, engineering, production and fleet support expertise,

- o Nuclear power plant design capabilities

The Impact of Competition

The Navy's current plan -- SSN 23 in FY96 and continuation of the New Attack Submarine Design/Build process at Groton, CT -- preserves two nuclear capable shipbuilders and permits competition to be introduced when it is advantageous to the government.

Simply put, potential competition in the New Attack Submarine program is an issue of timing. In order to adequately sustain competition there must be a sufficiently high build rate of at least 2 submarines per year. The New Attack Submarine program does not achieve this level of build rate until FY2002 and beyond. There is also the question of when we will build the next carrier.

Introducing competition now is not in the best interest of the government based on the following:

- o It would reduce the benefits of the design/build approach.

- o Near term construction activity is insufficient to sustain two production yards

- o It would force a downsizing to a single nuclear capable shipbuilder if Groton, CT were to lose the competition,

- o It would require both yards to participate in the current New Attack Submarine design process with undesirable results including: increased design costs, no benefit form SEAWOLF lessons learned, i.e. forces split design production effort, breaks down existing partnerships with suppliers and limits benefits from the current design/build process.

- o It would extend the construction period of the New Attack Submarine lead ship.

Introducing competition in the future may be more advantageous because:

- o It allows completion of New Attack Submarine design and supports an orderly transition to stable low rate production,

Document Separator

respectfully that the Government further consider Newport News Shipbuilding's offer of a more affordable way of implementing that procurement decision, and that we be allowed to compete for the business.

and we are dramatically reducing our cost to produce ships - - both naval and commercial.

IV. Summary

The decision on where to build future submarines is an extraordinarily significant one for the U.S. Government. It constitutes a huge business decision which could ultimately determine if the submarine program can be an affordable weapon system and not dramatically impact the Navy's SCN accounts in the future. The decision whether or not to compete the New Attack Submarine is a momentous one; it will determine whether or not you will save billions of dollars in the cost of building submarines. This is at a time when the estimated five-year defense budget shortfall by the General Accounting Office and the Congressional Budget Office ranges from $65 to $150 billion. In order to ensure the savings associated with this competition, the Congress must take steps to make sure NNS' competitive position is not eroded between now and FY '98. These steps would include keeping NNS active in the submarine business by permitting us to have a substantial presence in the design, repair, and overhaul of submarines, work that we have traditionally done. The Submarine Study Group of this

Electric Boat at the rate of 1/2 a submarine per year over the next six years is simply not affordable. This plan is flawed by the simple economics of shipbuilding. Decreasing Navy shipbuilding backlogs place tremendous pressure on the abilities of yards to distribute the inherent fixed costs of construction -- both in facilities and people -- without substantial increases in indirect costs per vessel.

A shipyard must maintain a high enough volume of work to be cost competitive and efficient. Low volume production has proven to be very costly in less complex products like commercial ships, but even more so in the higher cost nuclear shipbuilding sector. Nuclear submarines simply cannot be built at affordable prices in <u>any</u> yard at these projected low rates unless the yard also has significant other work to absorb the fixed overhead costs.

In addition, building at such low volumes at a shipyard which has no other work has a very negative effect on the productivity of the skill trades and test personnel. For example, a building rate of 1/2 submarine per year means you deliver a submarine every two years. What happens with certified welders or test personnel when they complete their work and must wait 1 - 2 years for the next ship? Who pays for this inefficiency?

Newport News Shipbuilding considers itself to be the best submarine builder in the world -- both in terms of cost and quality.

We have been building nuclear submarines for almost 40 years. Today we are the builder of nuclear powered aircraft carriers and, with our competitor in Connecticut, one of two shipyards currently building nuclear submarines. Newport News has the capacity to build 3-4 submarines per year, which is obviously far in excess of any projected build rate.

We are the lead design yard for the LOS ANGELES and SEAWOLF Class attack submarines and by the year 2000 every attack submarine in the U.S. Navy fleet will have been designed by NNS. We have constructed 40% of today's attack submarine fleet. We also have extensive experience overhauling and refueling nuclear submarines.

Again, I believe Newport News Shipbuilding is the best, most cost effective submarine builder and designer in the world.

Document Separator