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Acting Under Secretary of Defense (Comptroller)

The Honorable Deborah P. Christie
The Navy Assistant Secretary for Financial
Management and Comptroller

Subject: Financial Management: Factors to Consider in Estimating Environmental Liabilities for Removing Hazardous Materials in Nuclear Submarines and Ships

Recent laws have enhanced the legislative requirements to provide policymakers and agency program managers with more reliable financial information to formulate budgets, manage government programs, and make difficult policy choices.[1] As a result, because the difficulty of making informed decisions is increased when complete and reliable information on the cost and consequences of government programs and activities is unavailable, these laws have made implementation of new accounting standards and audited federal financial statements a priority. New federal accounting standards have been adopted to enhance federal financial statements by requiring that government agencies show the financial results of their entire operations and provide relevant information on agencies' true financial status--information that has never before been required in this form. This report discusses one such requirement for valuable information related to the costs of removal and

[1]The Chief Financial Officers Act (CFO) of 1990, the Government Management Reform Act (GMRA) of 1994, and the Federal Financial Management Improvement Act of 1996.

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disposal of hazardous materials[2] from federal agencies' property, plant, and equipment such as submarines and ships. The Congress also addressed the concern about the significance of such costs in the National Defense Authorization Act for Fiscal Year 1995, which requires the Secretary of Defense to issue guidance on how to analyze, as early in the acquisition process as feasible, the life-cycle environmental costs for major defense acquisition programs, including the materials to be used and methods of disposal. The life-cycle cost estimates would be required before proceeding toward production of the major acquisition.

In October 1990, the Federal Accounting Standards Advisory Board (FASAB) was established by the Secretary of the Treasury, the Director of the Office of Management and Budget (OMB), and the Comptroller General of the United States to consider and recommend accounting standards to address the financial and budgetary information needs of the Congress, executive agencies, and other users of federal financial information. Using a due process and consensus building approach, the nine-member Board, which includes a member from the Department of Defense (DOD), recommends accounting standards for the federal government. Once FASAB recommends accounting standards, the Secretary of the Treasury, the Director of OMB, and the Comptroller General decide whether to adopt the recommended standards. If they are adopted, the standards are published as Statements of Federal Financial Accounting Standards (SFFAS) by OMB and GAO. In addition, the Federal Financial Management Improvement Act of 1996, as well as the Federal Managers' Financial Integrity Act, require federal agencies to implement and maintain financial management systems that substantially comply with these accounting standards.

Beginning with fiscal year 1998, these federal accounting standards require that financial statements contain information about the extent of an agency's environmental liabilities for the cleanup[3] of hazardous materials related to

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[2]See enclosure III for a listing of hazardous materials in submarines and ships. The removal of hazardous materials in nuclear submarines and ships during the inactivation and disposal process may give rise to the creation of hazardous waste. Hazardous waste disposal is governed by the disposal requirements of the Resource Conservation and Recovery Act and the implementing regulations.

[3]SFFAS 6, Accounting for Property, Plant, and Equipment, defines cleanup as the removal, containment, and/or disposal of (1) hazardous waste from property or (2) material and/or property that consists of hazardous waste at permanent or temporary closure or shutdown of associated property, plant, and equipment.

federal agencies' property, plant, and equipment. For DOD, mission assets[4] such as submarines, ships, aircraft, and combat vehicles are a major category of property, plant, and equipment. In fiscal year 1996, DOD reported over $586 billion in this category. Because most of DOD's mission assets contain hazardous materials, DOD has an undisclosed liability for the cleanup of those materials. To address this requirement, DOD officials have told us that they have begun work to set a policy to guide the Departments of the Army, Navy, and Air Force in reporting on environmental liabilities related to mission assets. Navy officials have stated that they are waiting for DOD's policy on what is to be included as environmental costs before they develop implementing regulations of their own.

We undertook this review to assist DOD in its efforts to meet the new SFFAS 6 reporting requirement and because of our responsibility to audit the federal government's consolidated financial statements beginning with fiscal year 1997. Our objectives were to (1) determine whether an estimate of the minimum environmental liability could be made and (2) identify key factors DOD should consider as it develops its policy. Enclosure I contains further details on our scope and methodology.

Because the removal and disposal processes for the hazardous materials and/or waste differ widely for each type of mission asset (for example, submarines, ships, aircraft, combat vehicles, and missiles), the approach taken to estimate these costs might also differ significantly. This review of nuclear submarines and ships is one in a series of reviews we are conducting to address DOD environmental liabilities associated with various types of mission assets.

ENVIRONMENTAL LIABILITIES RELATED TO NUCLEAR SUBMARINES AND SHIPS CAN BE ESTIMATED

All nuclear submarines and ships contain hazardous materials and waste that must be removed and disposed of when they are inactivated.[5] The Department

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[4]SFFAS 6 defines federal mission property, plant, and equipment as possessing certain characteristics related to (1) its use, such as having no expected nongovernmental uses, and (2) its useful life, such as a very high risk of being destroyed in use or premature obsolescence.

[5]Inactivation processes are tailored to each specific submarine and ship and include equipment, inventory, and supplies reutilization; preservation; long-term storage;

of the Navy's management information systems contain data that can be used to estimate an environmental liability as a portion of the costs to inactivate and dispose of nuclear submarines and ships. For example, these systems include cost information on nuclear submarines and ships currently undergoing inactivation or disposal activities. As discussed in enclosure II, the estimated environmental costs associated with the shipyards' inactivation and disposal[6] activities related to a nuclear submarine could range, at a minimum, from $18.7 million to $61.0 million. This range in environmental costs should narrow as DOD establishes its policy on what constitutes an environmental cost and the Navy determines which shipyards will perform the inactivation procedures.

Although the Navy has not yet completed the inactivation and disposal of a nuclear surface ship, Navy officials have estimated the environmental costs to be significantly more than those for a nuclear submarine due to the size and structure of the ships, the increased number of nuclear reactors per ship, and the type of reactor compartments. For example, the Navy provided us the costs for four nuclear cruisers that were undergoing inactivation and disposal, which ranged from $146 million to $239 million. In 1996, Navy officials provided a cost estimate that ranged from $807 million to $942 million[7] for the inactivation and disposal of the first Nimitz-class nuclear carrier if the work was begun in fiscal year 1998. Subsequently, they stated that as the Navy gains experience in defueling during the refueling cycles of Nimitz-class carriers, they expect the cost estimate for inactivating and disposing of Nimitz class carriers could be reduced to about $500 million for the tenth Nimitz class carrier. The Navy has not provided a basis for us to assess the reasonableness of the $500 million estimate, although as the Navy gains experience in the inactivation and disposal of aircraft carriers, cost efficiencies could occur. Ultimately, whatever the actual cost experience is, the estimate will need to be adjusted to reflect actual experience.

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safe storage; safety precautions; reactor and missile compartment disposal; towing; and hull disposal or recycling.

[6]For the purposes of this letter, the term "disposal" excludes the temporary storage and final disposition of spent nuclear fuel. As discussed in the next section, this is a factor that must be addressed in DOD's policy.

[7]Navy provided the estimated cost for the Nimitz-class carrier in 1996 dollars, and the range for the four nuclear cruisers in 1995 dollars. For comparison purposes, we adjusted the cruiser estimates to 1996 dollars using the Department of Defense Deflator Table 5-6 contained in the National Defense Budget Estimates for Fiscal Year 1997.

Navy officials stated that they have not developed environmental cost estimates because they are waiting for DOD to set policy on what is to be considered environmental costs. As is the case with submarines, any environmental liability estimated for nuclear ships will be affected by how DOD defines what should be included as environmental costs and addresses the various factors discussed in the following section.

FACTORS TO BE CONSIDERED IN ESTIMATING ENVIRONMENTAL LIABILITIES

Accounting standards state that if it is probable that the environmental liability will fall within a range of potential costs, the lowest amount in the range should be recorded as the liability, unless an amount within the range is the most likely estimate to occur.[8] In estimating an environmental liability for all of the Navy's submarines and ships, various factors need to be addressed as DOD develops its policy and chooses the appropriate methodology. Specifically, DOD must (1) clarify that nuclear waste is a type of hazardous material as contemplated by the accounting standard and (2) provide guidance on what specific activities and costs should be considered environmentally related.

The federal accounting standards require federal agencies, including DOD, to report in their fiscal year 1998 financial statements a liability associated with the cleanup of hazardous materials related to federal agencies' property, plant, and equipment. Navy shipyard officials responsible for inactivation activities held divergent opinions on what should be considered hazardous material, including whether radioactive material should be included. Although the federal accounting standard makes no distinction between hazardous material and radioactive material, these officials, referring to definitions in other, unrelated regulations that appear to distinguish hazardous waste from radioactive waste, question whether the accounting standards apply to radioactive waste.[9] If DOD and Navy officials apply this distinction in interpreting the federal accounting standard requirement to record a liability related to the cleanup of hazardous

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[8]SFFAS 5, Accounting for Liabilities of the Federal Government, establishes the criteria for recognizing liabilities, including environmental liabilities, that are required for plant, property, and equipment, including mission assets.

[9]The Nuclear Regulatory Commission regulations define radioactive material and waste in 10 C.F.R., Part 20, for licensing purposes. In 40 C.F.R., Part 261, the Environmental Protection Agency (ERA) defines hazardous waste for regulatory purposes. These Navy officials argue that EPA's definition of hazardous waste does not include radioactive material.

materials, the most significant environmental-related liability, the disposal of radioactive material, may be inappropriately excluded.

In addition, Navy officials had differing views on the specific inactivation activities that should be included in the environmental cost. For example, except for defueling[10] activities, some shipyard officials excluded supervision and other indirect costs related to nuclear activities in their estimates of environmental cost. Furthermore, DOD policy needs to address the extent to which costs such as towing and escort ships, crew and other military personnel, subsequent storage, reimbursable work, and offsets for reutilized material should be included. Finally, the different classes and types of submarines and surface ships and their relationship to current inactivation experience should be considered. More detailed information on each of these factors and the effect on the environmental liability is included in enclosure II.

The estimated liability is also to be adjusted annually based on changes to the factors used to calculate the liability. Factors that could change the estimated environmental liability and which should be addressed in the policy and procedures adopted by DOD are (1) changes to environmental laws and regulations that impact the level of effort or activity required to dispose of the nuclear and hazardous materials and waste, (2) submarines or ships lost in training or armed conflicts, or sold to foreign governments, (3) increases in inventory levels as additional nuclear submarines and ships are added, (4) changes in the nuclear and hazardous materials contained in the additional vessels, (5) changes in technology, and (6) refinements to DOD's methodology. Regardless of the approach DOD chooses, the estimates will gain greater accuracy over time through improvements to methodology, data reliability, and financial management systems.[11]

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[10]Defueling includes the removal and handling of nuclear fuel. Final storage and disposal of the spent nuclear fuel is not included in defueling.

[11]It should be noted that we and the Naval Audit Service have reported problems in the reliability of information in the Navy's accounting and logistical systems. While there are limitations in the data, the Navy is working to improve the systems, which should, over time, increase the accuracy of the information and improve the environmental liability estimates. See GAO reports entitled CFO Act Financial Audits: Increased Attention Must Be Given to Preparing Navy's Financial Reports (GAO/AIMD-96-7, March 27, 1996) and DOD Accounting Systems: Efforts to Improve System for Navy Need Overall Structure (GAO/AIMD-96-99, September 30, 1996), and the Naval Audit Service's report entitled Department of the Navy Annual Financial Report, Fiscal Year 1996.

TOTAL DISPOSAL COSTS AND BREAKDOWN BY TIME PERIOD MAY BE USEFUL

Navy officials suggested that the total cost to inactivate and dispose of nuclear submarines and ships, and not just the environmental costs, may provide useful information and is more consistent with their existing information systems and operational and budget requirements. Total cost information would be consistent with the life-cycle information the Congress already requires for major defense acquisition programs.

The new accounting standards would not preclude accounting for and reporting as a liability the total cost of inactivation and disposal of nuclear submarines and ships. Navy shipyard personnel agreed that the majority of the costs were environmentally related but had differing views on what percentage of inactivation and disposal costs were driven by environmental costs. Such estimated percentages ranged from 72 percent to 100 percent per submarine. Depending upon DOD's definition of environmental costs, the total costs may not differ significantly from the environmental portion of inactivation and disposal costs and could be used for satisfying the new federal accounting standards.

Regardless of whether the reported environmental liability is based on solely the environmental costs associated with the cleanup and disposal of submarines and ships or total disposal costs, the result will be a large liability--much of which would not require outlays in the current year. A breakdown of the liability could be provided in a footnote to the financial statements based on the approximate time periods when the inactivations are expected to occur. Such information could provide important context for congressional and other budget decisionmakers on the annual impact of inactivations that have occurred or are expected to occur during various budget periods, including those outside the Future Years Defense Program.

HAZARDOUS MATERIALS ALSO PRESENT IN NON-NUCLEAR SHIPS

This review focused on nuclear submarines and ships, which will have a significant impact on DOD's and the Navy's estimated environmental liability. However, hazardous materials are also present in the Navy's non-nuclear powered ships. As of September 30, 1996, the Naval Vessel Register reported a total of 580 non-nuclear powered ships, including 209 active and 107 that were

in various stages of disposal.[12] Examples of the types of hazardous materials and waste in these ships are included in enclosure III. Determining the inactivation and disposal costs related to the removal and disposal of hazardous material and waste on these ships is also highly dependent on the resolution of the factors discussed previously. Navy officials have indicated that once DOD management provides guidance on which costs are considered to be environmental, the Navy's management information systems can be programmed to capture the environmental data.

CONCLUSIONS

As discussed in this letter and accompanying enclosures, the Navy's management information systems contain sufficient data to develop a minimum estimate of the environmental liability for the inactivation and disposal of nuclear submarines and ships. As DOD and the Navy develop their policies, the factors identified in this letter should help in choosing an appropriate methodology for estimating this environmental liability related to nuclear submarines and ships. The factors identified are also critical for determining the environmental liability associated with the large inventory of non-nuclear powered ships.

AGENCY COMMENTS AND OUR EVALUATION

The Department of Defense generally agreed with the contents of this letter. In its written statement (see enclosure IV), DOD stated that to ensure that the Department complies with the reporting requirements beginning in fiscal year 1998, an environmental liabilities working group was recently established to address environmental liability issues and financial statement reporting requirements. The group is comprised of representatives from the functional, financial management, and audit communities.

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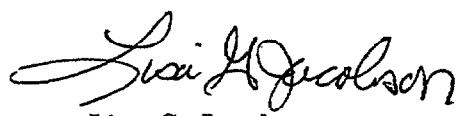
We are sending copies of this letter to the Chairmen and Ranking Minority Members of the Senate Committee on Armed Services, the House Committee on National Security, the Senate Committee on Governmental Affairs, the House Committee on Government Reform and Oversight, and to the Director of the

[12]The remaining ships were in several categories, such as Military Sealift Command, Reserve Forces, Inactive Category B–Repair and Overhaul, and National Defense Reserve.

Office of Management and Budget. We are also sending copies to the Secretary of Defense; the Under Secretary of Defense for Acquisition and Technology; the Deputy Under Secretary of Defense for Environmental Security; the Assistant Secretary for Financial Management and Comptroller, Air Force; the Assistant Secretary for Financial Management and Comptroller, Army; and the Acting Director, Defense Finance and Accounting Service. Copies will be made available to others upon request.

Please contact me at (202) 512-9095 if you have any questions concerning this letter. Major contributors to this letter are listed in enclosure V.



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SCOPE AND METHODOLOGY

To gain an understanding of the procedures and the financial and logistical management information systems that are used to account for and report the inactivation and disposal of nuclear submarines and ships, we interviewed DOD and Navy officials to discuss inactivation and disposal management and reporting. We also reviewed applicable DOD and Navy instructions and regulations.

All nuclear submarines and ships are owned by the Department of the Navy, except for one nuclear freighter that is owned by the Maritime Administration. Therefore, we focused our work at the Naval Sea Systems Command and its directorates, shipyards, and facilities that execute the inactivation and disposal program and operations.

To determine if an environmental liability could be estimated, we reviewed the Statement of Federal Financial Accounting Standards 5 and 6 for criteria. We interviewed Navy officials that were responsible to command, direct, and execute the inactivation and disposal program for nuclear submarines and ships. Specifically, we

- reviewed the Naval Vessel Register to determine the submarine and ship inventory;
- reviewed Jane's Fighting Ships, a reference book that described each of the Navy's submarines and ships;
- visited the Naval Sea Systems Command Directorates at Arlington, Virginia; the Navy Inactive Fleet Detachment at Portsmouth, Virginia; three of the four Naval Inactive Ship Maintenance Facilities; and all four Naval shipyards;
- analyzed financial and logistical reports, called the "Ship Departure Reports," which showed whether it was an attack or ballistic submarine, hull numbers, budgetary amounts, expenditures, and costs to inactivate and dispose of nuclear submarines;
- obtained nuclear ship cost estimates for reactor compartment disposals and hull recycling;
- held discussions with Navy officials to determine if the financial and logistical reports coming from their management information systems (specifically, the Ship Departure Reports) could be used to estimate an environmental liability; and
- held meetings with Navy officials and analyzed their Ship Departure Reports for nuclear submarines that had undergone inactivation and disposal at Naval shipyards to determine the environmental cost as a percentage to the actual

shipyard cost reported in the departure reports. We did not audit the data in the financial and logistical management information system reports.

In addition, Navy officials provided us with the following reports related to nuclear material and waste:

- U.S. Naval Nuclear Powered Submarine Inactivation, Disposal and Recycling.
- Environmental Monitoring and Disposal of Radioactive Wastes From U.S. Naval Nuclear Powered Ships and Their Support Facilities.
- Occupational Safety, Health and Occupational Medicine Report.

During our review, we contacted personnel and/or conducted work at DOD Headquarters; the Naval Sea Systems Command; the Navy Inactive Fleet Detachment, Portsmouth, Virginia; the Naval Inactive Ship Maintenance Facilities at Bremerton, Washington, Pearl Harbor, Hawaii, and Portsmouth, Virginia; the Naval shipyards at Norfolk, Virginia, Pearl Harbor, Hawaii, Portsmouth, New Hampshire, and Puget Sound, Bremerton, Washington; the Defense Reutilization and Marketing Service, Battle Creek, Michigan; and other locations as needed.

We conducted our review between July 1996 and June 1997 in accordance with generally accepted government auditing standards. We requested and received written comments, which are discussed in the "Agency Comments and Our Evaluation" section and reprinted in enclosure IV.

ENVIRONMENTAL LIABILITY FOR NUCLEAR SUBMARINES AND SHIPS CAN BE ESTIMATED

The Navy has information available to estimate the environmental costs associated with the inactivation and disposal of nuclear submarines and ships. The Navy produces financial and logistical reports that can be used to calculate an estimated environmental liability as a portion of the cost to inactivate and dispose of nuclear submarines and ships. The four Naval shipyards use financial and logistical automated systems to track the inactivation and disposal costs of nuclear submarines and ships. Each shipyard uses the Standard Shipyard Management Information System (SSMIS), an automated cost accounting system, and the Baseline Advanced Industrial Management System (BAIMS), an automated logistical and project management system. SSMIS uses the logistical data from BAIMS to produce the Ship Departure Report, which provides costs for the inactivation and disposal of nuclear submarines and ships. The key elements needed to prepare an estimated environmental liability are (1) the types and quantities of nuclear submarines and ships in the inventory, (2) the kinds of hazardous material and waste found in them, and (3) the cost information.

INVENTORY OF NUCLEAR SUBMARINES AND SHIPS

The Navy has responsibility for all nuclear submarines and ships and maintains an inventory of them in the Naval Vessel Register. Table II.1 shows the total per type of nuclear submarines and ships in two categories–active and awaiting, or in the process of, disposal.

Table II.1: Nuclear Submarines and Ships From the Naval Vessel Register as of September 30, 1996

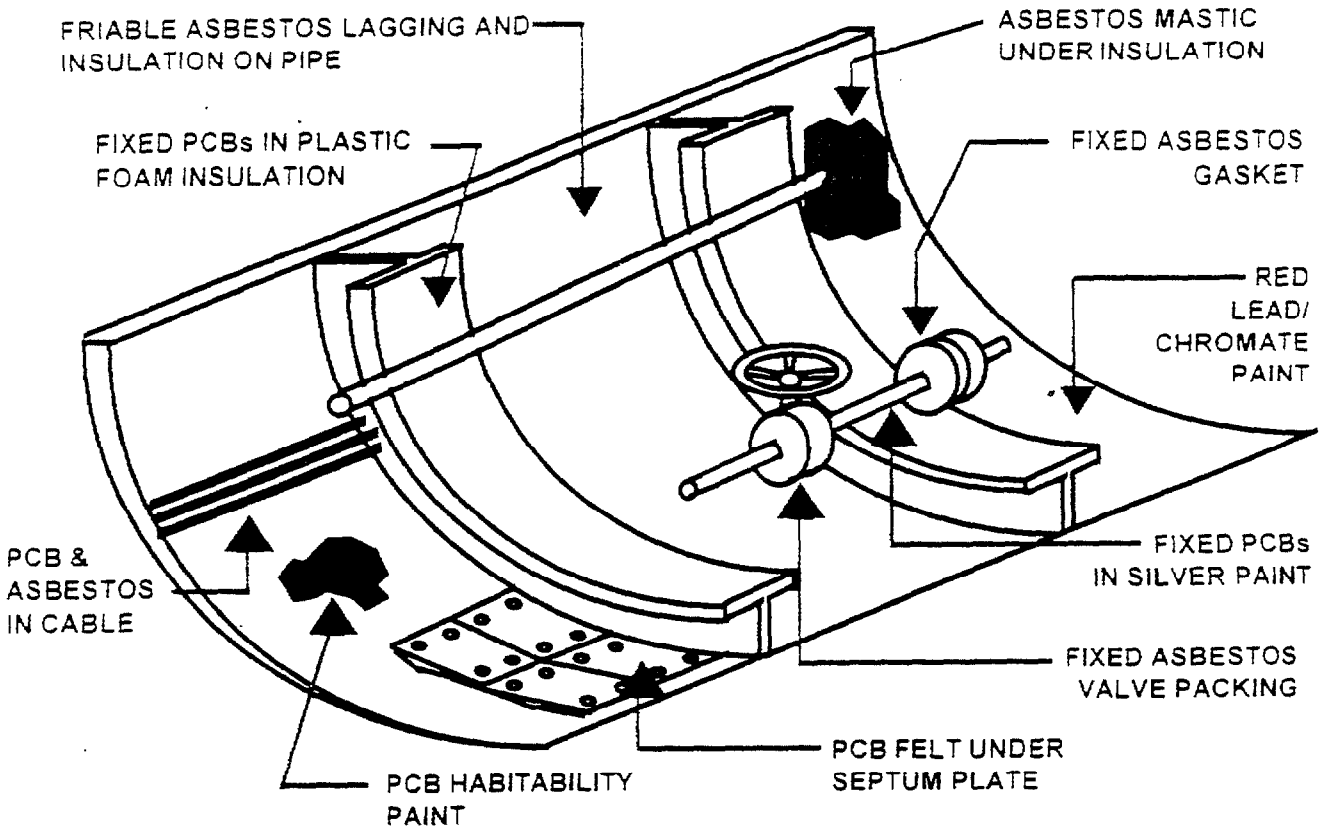
Type	Active fleet	Awaiting or in process of disposal	Total
Submarines			
Ballistic	17	9	26
Attack	79	31	110
Subtotal submarines	**96**	**40**	**136**
Surface ships			
Cruiser	3	6	9
Aircraft carrier[a]	8	0	8
Subtotal surface ships	**11**	**6**	**17**
Total	**107**	**46**	**153**

[a]Consists of seven Nimitz class carriers (two reactors per carrier) and the carrier Enterprise, which has eight reactors.

IDENTIFICATION OF NUCLEAR AND HAZARDOUS MATERIALS AND WASTE

Navy officials provided us with lists and charts of nuclear and hazardous material and waste that must be disposed of during the inactivation and disposal of nuclear submarines and ships. For example, figure II.1 shows some of the different hazardous materials and their possible locations within a nuclear submarine hull. See enclosure III for a list of nuclear and hazardous material and waste in nuclear submarines and ships and non-nuclear ships.

Figure II.1: Hazardous Materials Within a Submarine Hull



Source: Department of the Navy.

Navy officials stated that they use the definitions for radioactive (nuclear) and hazardous materials and waste that are contained in 10 C.F.R. (Energy) and 40 C.F.R. (Protection of Environment). In addition, the Chief of Naval Operations (OPNAV) provides instructions for the inactivation and disposal programs, such as OPNAVINST 5090.1B, Environmental and Natural Resources Program Manual; the Naval Ships Command Technical Manual, Chapter 050, "Inactivation and Maintenance of Ships and

Craft;" OPNAVINST 4770.5F, Manual for the Inactivation, Maintenance, and Disposal of Ships and Service Craft, including nuclear submarines and ships; and U.S. Naval Nuclear Powered Submarine Inactivation, Disposal, and Recycling.

ESTIMATED ENVIRONMENTAL COST
CALCULATION FOR NUCLEAR SUBMARINES

The inactivation and disposal of attack and ballistic nuclear submarines is done in three phases: (1) inactivation, including defueling and storage of the nuclear material, (2) reactor compartment removal and disposal, and (3) recycling of the submarine hull. The four Naval shipyards perform the first phase. Only one shipyard, Puget Sound, completes phases 2 and 3 for all nuclear submarines and ships. Consequently, all nuclear submarines and ships inactivated at the other three shipyards must be towed to Puget Sound for reactor compartment removal and disposal. While we did not analyze the differences in inactivation costs among the four shipyards, our 1992 report included this type of analysis.[13]

[13]Nuclear Submarines: Navy Efforts to Reduce Inactivation Costs (GAO/NSIAD-92-134, July 21, 1992). In that report, the Navy estimated that it would cost about $2.7 billion to inactivate 100 nuclear submarines and dispose of about 85 of them by the year 2000.

Table II.2: Estimated Environmental Cost as an Integral Part of Inactivation and Disposal Per Attack Submarine Hull

(Dollars in millions)

	Shipyard			
	Portsmouth	**Norfolk**	**Pearl Harbor**	**Puget Sound**
Inactivation costs per shipyard	$45.8	$36.7	$27.6	$ 8.1
Environmental percentage of inactivation cost	100%	99%	57%	43%
Estimated environmental portion of inactivation costs	$45.8	$36.3	$15.8	$3.5
Average reactor compartment disposal and hull recycling cost [a]	$15.2	$15.2	$15.2	$15.2
Estimated environmental cost per hull	$61.0	$51.5	$31.0	$18.7
Percentage of environmental cost compared to total shipyard inactivation and disposal cost per hull	100%	99%	72%	80%

[a]All nuclear submarines that have undergone inactivation at Portsmouth, Norfolk, and Pearl Harbor must be towed to Puget Sound Naval Shipyard for reactor compartment disposal and hull recycling.

Source: Based on cost data reported by the shipyards in their Ship Departure Reports for nine nuclear submarines and other data provided by Navy officials. We did not audit these data.

Table II.2 shows the inactivation costs and estimated environmental portion of those costs per attack submarine hull. This information is provided to demonstrate that cost data are available. An analysis of the reasonableness of the cost data was not made and the data should not be used to compare inactivations done at different shipyards. Navy officials stated that these costs varied among shipyards because of differences in what is included as inactivation costs and the size and complexity of the submarines being inactivated. The inactivation costs, which are based on the costs reported by the shipyards for nine nuclear submarines,[14] varied considerably from shipyard to shipyard–ranging from $8.1 million to $45.8 million. The estimated environmental portion ranged

[14]These include the five most recent submarines for which Puget Sound removed the reactor compartments and the four most recently inactivated submarines at the other three shipyards.

from $3.5 million to $45.8 million. Puget Sound is the least expensive location for inactivating and disposing of nuclear attack submarines.[15]

The inactivation work performed at the other shipyards is more expensive primarily because (1) the nuclear submarines must be prepared for waterborne storage, which includes establishing a watertight hull integrity that will support a minimum of 15 years of wet storage at Puget Sound, (2) the nuclear submarines must be modified to be towed thousands of miles, including installing special towing equipment and modifying some ship systems for use during the tow to Puget Sound for reactor compartment removal and disposal and hull recycling, and (3) the type of submarine and the scope of work to be accomplished. These preparations and modifications increase the scope of work and labor at the other shipyards, resulting in inactivation cost variances between the shipyards.

The range in the environmental portion of inactivation costs resulted primarily from the differences in shipyard officials' estimates of the environmental cost as a percentage of shipyard inactivation costs. The range of estimates–from 43 percent to 100 percent–reflected the absence of an official definition of an environmental cost, and is an indication that opinions about what should be included differed considerably. More detail about these differences is found in table II.3. However, the overall environmental cost percentage for both inactivation and disposal ranged from 72 percent to 100 percent. Thus, shipyard officials were in agreement that the majority of the actual costs were environmental.

The estimated environmental cost per hull, as shown in table II.2, included (1) the estimated environmental portion of inactivation costs and (2) the reactor compartment disposal and hull recycling average cost of $15.2 million. The average reactor compartment disposal and hull recycling cost included the costs related to (1) sending reactor compartments to the Department of Energy's Hanford, Washington, nuclear disposal site and (2) cutting submarine hulls into pieces and sending them to a specific smelter that melts the pieces at a high temperature that virtually eliminates its impact on the environment. It excludes storage and disposal of spent nuclear fuel.

[15]In our previously mentioned 1992 report, we stated that it would be cheaper for the Navy to do all nuclear submarine inactivation and disposal at the Puget Sound Naval Shipyard. However, Navy officials stated that for strategic purposes, they wanted to maintain the nuclear defueling and fueling capability at other shipyards.

Table II.3 shows the shipyard officials' views on what constitute environmental costs associated with the three categories within the inactivation phase. Examples of activities performed in each of the three categories include the following.

- Defueling includes the removal and handling of nuclear fuel.
- Nuclear includes conducting surveys, shutting off the nuclear plant, and draining and sealing related tanks and systems.
- Non-nuclear includes engineering; planning and project management; testing, removal, and disposal of materials, fluids, and fuels; removal of equipment; installation of temporary ship systems; utilities and other dock services; and preparation for tow.

Table II.3: Shipyard Officials' Views on Environmental Costs for the Inactivation Phase

Inactivation category	Portsmouth	Norfolk	Pearl Harbor	Puget Sound
DEFUELING: Direct and indirect costs	All costs	All costs	All costs	All costs
NUCLEAR: Direct cost includes production and hazardous material handling equipment; indirect costs include administration, planning, or supervision.	All costs	All costs	Most costs–excludes a few indirect costs as noted.	Minimal costs–excludes all indirect costs as noted.
NON-NUCLEAR: Direct cost includes handling hazardous materials and specific planning, engineering, and project management and safety activities; indirect cost includes administration, planning, or supervision.	All costs	Most costs–excludes a few indirect costs as noted.	Minimal costs–excludes all indirect costs as noted.	Minimal Costs–excludes all indirect costs as noted.

LEGEND
Minimal Costs=Activities and associated costs of these activities are 50 percent or less environmental.
Most Costs=Activities and associated costs of these activities are more than 50 percent but less than 100 percent environmental.
All Costs=Activities and associated costs of these activities are 100 percent environmental.

Source: Department of Navy officials and documentation provided.

As shown in table II.3, some officials believed that certain inactivation costs were not environmentally related, while others felt that most or all of the inactivation work was an environmental cost. For example, the main differences were associated with direct and indirect costs. Examples of direct costs include direct production and hazardous material handling equipment. Examples of indirect costs are administration and supervision. All shipyard officials agreed that the direct costs for handling and storage or disposing of nuclear and hazardous material and waste should be an environmental cost. However, they generally disagreed on what indirect costs should be considered environmental. The shipyard officials agreed that all indirect costs involved in defueling should be an environmental cost.

As noted previously in table II.2, the estimated environmental cost per hull, based on nine attack nuclear submarines reviewed, ranged from $18.7 million to $61.0 million. The ultimate liability that would result from this range of costs could dramatically change depending on where the inactivation and disposal activities actually take place. Thus, DOD must determine or make appropriate assumptions as to where such activities will occur. Also, DOD needs to determine whether the following inactivation costs should be included in the definition of an environmental cost:

- salaries of the submarine crews and other military personnel;
- towing and escort ships, including their crews and military personnel;[16]
- reimbursable costs, such as removing antennas and other equipment;
- subsequent storage costs, such as hull storage at Puget Sound and reactor compartment disposal at the Department of Energy's Hanford, Washington, site and storage and ultimate disposal of the spent nuclear fuel; and
- offsets for reutilized material.

Even though ballistic submarines are larger and more complex,[17] they undergo the same three phases for inactivation and disposal as attack nuclear submarines. The inactivation

[16]In our 1992 report, we estimated that based on fiscal year 1991 costs, the tow and escort ships consumed between $40,000 and $270,000 in fuel per tow.

[17]Ohio class ballistic missile submarines are almost three times the size of attack submarines, and the structure of the missile compartment requires more work because it affects all three decks and the hull and there is a lot of metal to be disposed of. In addition, the inactivation has to be done in line with the strategic arms limitation treaties.

phase could be performed by all four shipyards. Puget Sound recently performed all three phases for two of the last three Benjamin Franklin/James Madison class nuclear ballistic missile submarines. These two are a little less than half the size of an Ohio class submarine, but are about 20 percent larger than a Los Angeles class attack submarine. Puget Sound reported that the average cost for the two ballistic missile submarine inactivations and disposals was $31.0 million per submarine, which reflects about $7.8 million (or 34 percent) more for the ballistic submarine inactivation and disposal than attack submarines. As noted in table II.2, the inactivation cost for attack submarines varied among shipyards. It would seem reasonable to assume that if ballistic submarine inactivations were performed at the other three shipyards, the inactivation costs would vary but would be greater than those incurred for attack submarines.

At a minimum, the environmental cost for each of the 136 attack and ballistic nuclear submarines would be the $18.7 million to $61.0 million cost associated with disposal of a nuclear attack submarine, the least costly to dispose of. However, this estimate is limited because it (1) is based on the estimated environmental cost per attack submarine only, (2) does not include the increased costs associated with the structural differences between the attack and ballistic inactivations and disposal, (3) does not include missile compartment disposal costs, and (4) is only the shipyard's cost.

The Navy can use the Ship Departure Reports and its knowledge about the differences between the two nuclear submarines to refine the estimate that is shown here. In addition, Navy officials stated that once DOD provides an environmental liability policy with official definitions for environmental costs, they would be able to program their financial and logistical systems to provide the detailed information needed to calculate the estimated environmental liability.

ESTIMATED ENVIRONMENTAL COST CALCULATION FOR NUCLEAR SURFACE SHIPS

To date, the Navy has not completed inactivations and disposals for any nuclear surface ships–cruisers and aircraft carriers. However, Navy officials stated that the nuclear ships will follow the same inactivation and disposal processes as the nuclear submarines. The scope of work for each of the inactivation and disposal processes will increase due to ship size and structure, the amount of nuclear and hazardous materials and waste, and the number and type of reactors in each of the nuclear ships. For example, all of the nuclear cruisers and aircraft carriers have two reactors, except for one aircraft carrier that has eight reactors that must be disposed of. Also, the type of the reactors on the cruisers and aircraft carriers are different.

The increased scope of work will significantly increase the costs for the inactivation and disposal of nuclear ships. Although the Navy has not yet completed the inactivation and disposal of a nuclear surface ship, Navy officials estimated the environmental costs to be significantly more than those for a nuclear submarine due to the size and structure of the ships, the increased number of nuclear reactors per ship, and type of reactor compartments. For example, the Navy provided us the costs for four nuclear cruisers that are currently undergoing inactivation and disposal that ranged from $146 million to $239 million. In 1996, Navy officials provided a cost estimate that ranged from $807 million to $942 million[18] for the inactivation and disposal of the first Nimitz-class nuclear carrier if the work was begun in fiscal year 1998. Subsequently, they stated that as the Navy gains experience in defueling during the refueling cycles of Nimitz-class carriers, they expect the cost estimate for inactivating and disposing of Nimitz class carriers could be reduced to about $500 million for the tenth Nimitz class carrier. Although the Navy has not provided a basis for us to assess the reasonableness of the $500 million estimate, we acknowledge that as the Navy gains experience in the inactivation and disposal of aircraft carriers, cost efficiencies could occur. Ultimately, whatever the actual cost experience is, the estimate will need to be adjusted to reflect actual experience.

Navy officials stated that they have not developed environmental cost estimates because they are waiting for DOD to set policy on what is to be considered environmental costs. As with submarines, any environmental liability estimated for nuclear ships will be affected by how DOD (1) defines what should be included as environmental cost and (2) addresses the previously discussed factors.

REPORTING ENVIRONMENTAL COSTS BY FUTURE TIME PERIODS WOULD BE USEFUL

Regardless of whether the reported environmental liability is based solely on the environmental costs associated with the cleanup and disposal of submarines and ships or, as discussed previously, on total disposal costs, Navy officials have pointed out that the result will be a large liability--much of which would not require outlays in the current year. One way to make this reported liability more meaningful to decisionmakers would be to provide a breakdown of the environmental liability in a footnote to the financial statements based on the approximate time periods when the inactivations are expected to

[18]The Navy provided the estimated cost for the Nimitz-class carrier in 1996 dollars and the range for the four nuclear cruisers in 1995 dollars. For comparison purposes, we adjusted the cruiser estimates to 1996 dollars using the Department of Defense Deflator Table 5-6 contained in the National Defense Budget Estimates for Fiscal Year 1997.

occur. Such information could provide important context for congressional and other budget decisionmakers on the total liability by showing the annual impact of inactivations that have already occurred or are expected to occur during various budget periods, including those beyond the Future Years Defense Program. Furthermore, if the time periods used to present these data were consistent with budget justification documents, such as DOD's Future Years Defense Program, this type of disclosure would provide a link between budgetary and accounting information, one of the key objectives of the CFO Act.

NUCLEAR AND HAZARDOUS MATERIAL AND WASTE IN NUCLEAR SUBMARINES AND SHIPS AND NON-NUCLEAR POWERED SHIPS

Examples of hazardous material and waste in nuclear submarines and ships and non-nuclear powered ships follows.

- ammunition
- anti-freeze
- asbestos
- bilge water
- carbon/zinc batteries
- chromium
- lead
- paint with lead, cadmium, or chrome constituents
- petroleum sludge
- polychlorinated biphenyls (PCBs)
- polysulfides

In addition, nuclear submarines and ships have low level and mixed radioactive waste and spent fuel from the reactor compartment that have to be cleaned and disposed of.

COMMENTS FROM THE DEPARTMENT OF DEFENSE

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COMPTROLLER

JUL 23

Mr. Gene L. Dodaro
Assistant Comptroller General
Accounting and Information Management Division
U. S. General Accounting Office
Washington, DC 20548

Dear Mr. Dodaro:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report "FINANCIAL MANAGEMENT: Factors to Consider in Estimating Environmental Liabilities for Removing Hazardous Materials in Nuclear Submarines and Ships," dated July 9, 1997 (GAO Code 918885/OSD Case 1408).

The Department generally concurs with the content of the draft report. In our efforts to ensure that the Department complies with the reporting requirement beginning in FY 1998, a working group recently was established that will address environmental liability issues and financial statement reporting requirements. This group is comprised of representatives from the functional, financial management and audit communities.

Sincerely,

Alice C. Maroni
Principal Deputy Under
Secretary of Defense (Comptroller)

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