

GAO

Testimony

For Release
on Delivery
Expected at
10:00 a.m. EST
November 8, 1990

BATTLESHIPS: Issues Arising From the Explosion
Aboard the USS Iowa

Statement of
Frank C. Conahan
Assistant Comptroller General
National Security and International Affairs
Division

Before the
Subcommittee on Economic Stabilization
Committee on Banking, Finance, and Urban Affairs
House of Representatives



Madame Chair and Members of the Subcommittee:

I am pleased to appear before the Subcommittee today to discuss the results of our work pertaining to the April 19, 1989, explosion aboard the U.S.S. Iowa.

Our work was based on requests received from you; the Honorable Sam Nunn, Chairman, Senate Armed Services Committee and the Honorable Howard M. Metzenbaum, United States Senate. We were asked to (1) conduct an independent investigation of the Navy's technical analysis of likely causes of the explosion, (2) examine the serviceability and safety of the equipment, (3) examine manning and training issues raised by the Iowa's Commanding Officer after the explosion, and (4) review the battleships' employment plans and mission. We asked the Department of Energy's Sandia National Laboratories to conduct a technical analysis and review the adequacy of the Navy's technical investigation. We addressed the other issues.

We have sent a draft report to the Secretary of Defense for comment and we will discuss that draft today. However, as you know, because of Sandia's findings, the Navy has reopened its investigation into the causes of the explosion. That investigation, with Sandia's involvement, is ongoing and we are monitoring it.

BACKGROUND

The four ships of the Iowa class are the last battleships built by the United States. They were originally commissioned between 1943 and 1944 and saw active service during both World War II and the Korean conflict. All four battleships were decommissioned by 1958. Except for the U.S.S. New Jersey's short recommissioning during the Vietnam conflict, battleships remained inactive for almost a quarter of a century.

All four battleships were recommissioned between 1982 and 1988. The ships' principal armament, as built, was a main battery of nine 16-inch guns and twenty 5-inch guns. The ships are heavily armored. During recommissioning, four of the 5-inch gun mounts were removed and more modern weapons systems were installed. These included provisions for 32 Tomahawk cruise missiles and 16 Harpoon missiles. The battleships' missions are built around their capability to attack a variety of targets--both other ships and targets ashore. The battleships, as recommissioned, require a crew of about 1,500 personnel. Because of budget constraints, the Secretary of Defense directed that the Navy decommission two battleships during fiscal year 1991. The Navy selected the Iowa and the New Jersey.

On April 19, 1989, five bags of propellant ignited in the open chamber of the center 16-inch gun of turret II during a gunnery

exercise. The 47 sailors in the turret died in the ensuing blast and fire. In its investigation of the incident, the Navy found that the explosion was most probably the result of a deliberate act and not of a defect in the gun or propellant.

RESULTS IN BRIEF

Before discussing in detail our findings in each of the areas reviewed, let me briefly summarize.

At our request, Sandia National Laboratories investigated several aspects of the incident and concluded that there was a plausible alternate scenario to the Navy's finding of an intentional act. As a result, the Navy initially halted all firings of the 16-inch guns and, with Sandia's participation, is doing further testing. In August, when the Navy deployed the battleship Wisconsin to the Persian Gulf area, it sought to lift the ban on 16-inch gun firing. By using a different propellant configuration and taking other management actions the Navy believed the ban could be lifted. Sandia agreed that the new propellant configuration made the chance for an accidental explosion highly remote and the ban on the Wisconsin has been lifted.

Sandia also investigated the Navy's theory of a deliberate act but could neither confirm nor deny the Navy's conclusion that foreign material residue in the rotating band of the projectile removed

from the gun was evidence of a chemically activated detonator device. The reopened investigation is again exploring this issue.

While we did not find evidence of any systemic serviceability or safety problems aboard the battleships, we did find systemic problems with the adequacy of supervisory personnel levels, including gunners mates and fire controlmen, and problems with Navy training for 16-inch gun operations. Also, the Navy's investigation of the incident found some safety violations aboard the Iowa and a subsequent investigation by the Navy's Inspector General confirmed that improperly approved experimentation of gunpowder and projectile combinations was being conducted on the day of the accident and had also been conducted before.

Finally, as the world security environment changes, because ships other than battleships have an excellent strike warfare capability, and because of limits on the battleships' ability to support a large scale amphibious assault; the Navy's need to maintain the battleships is questionable. The planned decommissioning of two battleships, including the Iowa, also raises questions about the usefulness and supportability of the other two ships in the active fleet.

Budget constraints led to the decision to decommission two of the four battleships. The battleships are costly to maintain and difficult to man and, until the ships' unique contributions in the

Middle East can be evaluated, mission-related questions concerning their contributions remain.

For these reasons, we are recommending that the Secretary of Defense direct the Secretary of the Navy to reevaluate the battleships' utility in the light of known constraints and limitations and, unless current Middle East operations convincingly demonstrate their unique utility, direct that the Secretary of the Navy decommission the Missouri and the Wisconsin.

SANDIA'S REVIEW OF NAVY TECHNICAL FINDINGS

At our request, Sandia concentrated on two areas. First, Sandia explored whether the Navy's finding of foreign material in the rotating band of the projectile lodged in the Iowa's gun and the Navy's analysis of such material indicated that an improvised chemical detonator ignited the powder and caused the explosion. A major constraint to Sandia's analysis was that, after the Navy's and the FBI's analyses, there was no longer any part of the Iowa's rotating band that had not been subjected to an analysis or examination. However, Sandia obtained parts of the band to examine and was able to build upon the Navy's analysis. Sandia is confident in its findings that the foreign materials found in turret II on the Iowa were consistent with the nominal levels found throughout gun turrets and the maritime environment. For example, calcium--a constituent of the Navy's postulated detonator--was

readily detectable in both turrets I and II on the Iowa and in turrets on the battleships New Jersey and Wisconsin. Therefore, Sandia could not corroborate the Navy's finding that such foreign material was evidence of a detonator.

Second, Sandia explored whether the explosion could have been caused by an accidental ignition of the powder. Sandia agreed with the Navy's incident investigation report that the powder was stable and confirmed that a significant overram of the powder charge occurred. However, Sandia questioned the Navy's statement that impact and compression of the powder charge were not contributing factors to the Iowa incident.

Sandia believes they have identified a plausible alternative explanation of the cause of the explosion. According to Sandia, the forces generated by overramming the powder charge against the base of the projectile can fracture pellets in the bags' top or "trim" layer. The fractured pellets can release burning particles that may ignite the black powder in the adjacent powder bag and, in turn, ignite the whole charge. Sandia believes that the probability of this process occurring depends on the speed of the overram and the number of pellets in the trim layer.

Suggestion of a high-speed overram comes from (1) the Navy's incident investigation report, which noted that the rammerman was conducting his first live firing and that there were reports of an

unidentified problem with the center gun immediately before the explosion, and (2) Sandia's postulation that the car which brings the powder to the gun room had not returned, which it normally could have during the time of a normal speed ram, indicating that whatever occurred, happened quickly.

In making its analysis, Sandia also subjected samples of both the black powder and the cannon propellant to a variety of tests to determine their sensitivity to various ignition stimuli. Based on those test results, Sandia concluded that electrostatic discharge, electromagnetic radiation, friction, or thermal effects were not likely causes of the Iowa explosion.

Sandia also examined the possibility that the combustion of ether vapors released by the propellant could ignite the propellant itself. It concluded that ether vapors, if ignited, could not produce sufficient heat to ignite the propellant.

When Sandia reported on the results of its work it noted that it did not consider its study complete, in the sense that a clear and definite cause of the explosion had been identified, and it recommended areas of further investigation by the Navy.

When the Navy became aware of Sandia's preliminary findings, it initiated a series of tests, including the effects of impact forces on full-size powder charges. As you know, powder ignitions

have occurred during those tests, and the Navy subsequently suspended firing 16-inch guns aboard the battleships. The Navy's testing continues and Sandia is working with the Navy on those tests.

In August, when the Navy deployed the battleship Wisconsin to the Persian Gulf area it sought to lift the ban on 16-inch gun firing. To accomplish this, it took several actions in response to the issues that we raised during our work. Most significantly, for the type of gunpowder that was being used during the Iowa explosion, the Wisconsin will only use propellant charges that have no trim layer. For other types of gunpowder, the propellant charges will have at least 20 pellets in the layer. Sandia has agreed that this makes the chance of an accidental explosion highly remote. In addition, the Navy

- inspected all equipment in the turrets to ensure it was in safe operating condition,
- has ensured the proper quantity and quality of the gun crews, proper training and adherence to Personal Qualification Standards,
- provided training to gun crews on how to quickly inspect bag charges during handling and prior to loading to determine if any propellant grains have become loose, and
- marked the rammer control lever bracket in yellow at the proper position for ramming.

POWDER STABILITY/AMMUNITION PROBLEMS

Neither our analysis of ammunition reports nor Sandia's laboratory tests of Iowa powder samples indicate that chemically unstable powder was a likely cause of the explosion. We examined several data sources, including ammunition mishap and malfunction reports and investigations, to identify any chemical stability problems. Sandia tested the propellant to determine its chemical stability. Based on those tests, Sandia concluded that stabilizer levels were adequate and met specifications.

We also examined several data sources, including ammunition mishap and malfunction reports and investigations, to determine if they reflected any serious, systemic ammunition problems. We found no indications of problems with the specific type of propellant involved in the explosion. However, ammunition problems have been encountered with 16-inch ammunition components in the past. For example, there were problems with split propellant bags. A program is underway to correct that problem by using bags made of a different material. Other problems, which have also been addressed, were encountered with earlier versions of the primers used to ignite the powder charges. The primers had deteriorated in storage and were not reliably igniting the powder charges. A modified version of the primer has been produced.

While 16-inch ammunition components can be sensitive to unplanned heat, shock, or impact stimuli, the current inventory ranks 19th among the 25 munitions of greatest concern to the Navy. The requirement to meet the standards for insensitivity to those stimuli has been waived for the current inventory, however, because the Navy believes that the 16-inch inventory poses a relatively low danger compared to other shipboard munitions and because modifying other munitions has a higher funding priority.

Concerns were raised after the explosion over the ammunition's sensitivity to the effects of electromagnetic radiation. Communication and radar transmitters can transmit electromagnetic radiation that can cause ammunition components containing electrical circuits to detonate. The primer was the only ammunition component involved on April 19, 1989, that contains an electrical circuit, and it requires only moderate protection from electromagnetic energy; for example, it cannot be within 56 feet of a transmitting AN/WSC-3 antenna. Turret II is about 100 feet from that type of antenna, so this should not have been a concern. In its investigation, the Navy ruled out the primer as the cause of the explosion.

EQUIPMENT SERVICEABILITY

To determine if there were equipment serviceability problems, we reviewed maintenance reports for all four battleships from the date

of their reactivation to March, 1990 . This data disclosed no systemic problems with the material condition of the guns or the battleships in general. We also compared the data with similar data for other Navy surface combatants such as cruisers, destroyers, and frigates. This comparison indicated that the battleships do not present any undue material or supply support problems.

Navy ships are required to report all equipment failures affecting their ability to perform their mission that cannot be corrected within 48 hours. The reports identify the specific equipment problem and the reason that completing the repairs is delayed. Repairs may be delayed, for example, because needed repair parts are not available aboard ship or because the ship's crew needs outside technical assistance to complete the repairs. None of the reports affecting the 16-inch turrets reflected a severe impact on the ships' primary missions. The ships were still capable of providing 16-inch gun fire support despite the variety of failures encountered. We also noted that the numbers, types, and frequencies of reported equipment failures varied among the four ships. We found no pattern of failures that indicated systemic problems with the guns and other turret equipment.

We also compared the battleships' overall equipment readiness to that of other Navy surface combatants to determine if the battleships present any undue material or supply support problems.

They do not appear to do so. Between 1984 and 1989, for example, the battleships operated without any major equipment failures for a greater percentage of the time that they were operational than did surface combatants as a whole. The battleships had a better record in this regard for 19 of the 24 quarters in this period than did the surface combatants as a whole. Additionally, the battleships experienced no major equipment failures of any type during four quarters.

There were no distinct overall differences between the battleships and the other surface ships in the proportion of the total number of equipment failures due to the unavailability of repair parts, about 63 percent in each case. Only about 3 percent of the supply-related failures severely affected the battleships' ability to perform their missions compared to about 11 percent for the other ships.

Based on its visits to the Iowa, Sandia found that the powder hoist, powder door, rammer, and other equipment in the gun room appeared to have been in proper operating condition at the time of the explosion. It therefore concurred with the Navy's conclusion that mechanical operations were not associated with the explosion.

You asked if an alternative weapon system should be developed. In this regard, some safety modifications on the current system are

being explored because of Sandia's conclusion that an overram of the powder may have caused the Iowa incident.

SYSTEM SAFETY

Our review of battleship injury reports and previous turret powder fires revealed no prior safety problems with the 16-inch gun system that would indicate a relationship to the explosion on the Iowa.

Personal injuries

Any incident resulting in a fatality, a lost workday, an electrical shock, a person overboard, or a chemical or toxic exposure must be reported to the Navy Safety Center. We reviewed the reports of personal injuries and deaths occurring on board the battleships since their recommissioning and compared the results to injury rates on all surface ships to determine if this would reveal any systemic gun or ammunition problems. It did not.

Other than the Iowa's turret explosion, none of the reported incidents involved firing the 16-inch guns. One sailor, however, was injured in a turret during a training drill, and another was injured in a 16-inch magazine while conducting an operational test. Most of the incidents involved injuries such as inhalation of toxic fumes, contusions, and fractures incurred during routine

operations. For example, sailors slipped and fell on decks and ladders, had hatches closed on their hands, or were injured handling heavy equipment or supplies. Additionally, while some of the reported accidents involved electrical shocks, none were reported to have occurred in the 16-inch turrets.

We found that the injury rates for the battleships were lower than the rates of injuries on other ship types in 1987 and 1988. The battleships' 1989 rate would also have been lower if the Iowa explosion had been excluded from the data. While the Iowa had the highest injury rate of the four battleships in 1989 (again, due to the turret explosion), its injury rate was not the highest among the four battleships in 1987 and 1988.

Prior turret powder incidents

The Iowa incident appears to be unique among the incidents involving powder fires in the turrets aboard the Navy's battleships. We identified six other incidents of this type that resulted in fatalities between the turn of the century and the decommissioning of the battleships. None of the other incidents paralleled the Iowa's. Of the six, the Navy concluded that four were attributable to the ignition of powder charges by either combustible gasses or burning embers that remained in the gun barrels from a previous firing. In its investigation of the Iowa incident, the Navy concluded that the guns in turret II had not

fired that day; therefore, neither of these conditions could have caused the incident.

The two remaining incidents took place before World War I. One occurred when the primer in the breech block of a loaded gun fired as the breech was being opened. The other was caused by molten metal from an electrical short dropping on a powder bag.

Alleged problems

We could not corroborate several allegations that were made after the explosion about unsafe or unusual turret conditions. One allegation, for example, was that a 16-inch gun fired as soon as the breech block was closed. We could find no record of such an incident on board the Iowa, and none of the crew members we talked to were aware of it. However, such an incident occurred on the battleship U.S.S. Arizona in 1937.

SAFETY VIOLATIONS

According to the Navy's incident investigation report, approved procedures to ensure the safe firing of the 16-inch guns were not followed aboard the Iowa on April 19, 1989. The investigation noted, for example, that cigarette lighters, rings, and keys were found on the remains of the deceased sailors even though spark-producing items are prohibited in the turrets.

The Navy's investigation also found that Iowa personnel had improperly approved and were conducting gunnery experiments. Ship personnel were loading an inappropriate projectile/powder combination when the explosion occurred. This involved five bags of an unauthorized type of powder with a 2,700-pound projectile rather than six bags of the authorized type of powder. Improperly authorized combinations were fired on at least two other occasions. The Navy believed that neither the presence of spark producing devices nor the experimental firing caused the explosion.

The Navy Inspector General subsequently investigated the reported experiments with 16-inch projectiles and propellant and concluded that the firings in question on the Iowa were, in fact, improperly authorized and contrary to Navy procedures. His report concluded that the safety hazard posed to the Iowa's crew by the experiments was, at best, undetermined.

The Inspector General's report also noted other instances in which 16-inch ammunition components had been developed, funded, and tested by Naval Sea Systems Command activities without proper authorization. That report concluded that these actions had not posed a safety hazard to the Iowa's crew and had resulted from an unauthorized but institutionalized process.

MANNING

We found that, compared to other surface ships, battleships were not assigned an equal share of authorized enlisted supervisory personnel or personnel in ratings associated with gun turret operations. Additionally, the personnel assigned on battleships rated lower by several measures than those assigned to other ships.

Low Manning Level of Supervisory Personnel

We compared peacetime authorizations to on-board manning of the battleships with the average from a sample of surface ships at various times in the deployment cycle. We did not include the battleship Wisconsin because it has not deployed since its reactivation. The 17 surface ships included destroyers, cruisers, and amphibious assault type ships. We found that the overall percentage of authorized enlisted personnel assigned to the battleships was comparable to that of the sample ships. However, the manning levels of all battleship enlisted supervisors, including gunners mates and fire controlmen associated with the 16-inch turrets, were generally lower than those of the other ships in our sample.

The battleships overall and the Iowa deployed with significantly lower percentages of their authorized enlisted supervisors and turret-related journeymen. The ships in the sample deployed with an

average of 101 percent of their authorization for supervisory enlisted personnel (pay grades E-7 through E-9), while the Iowa and battleships overall deployed with 92 and 93 percent, respectively. These differences were more pronounced for gunners mates and fire controlmen, as table 1 shows. The situation was similar with regard to journeymen (pay grades E-5 and E-6) in the gunners mate and fire controlman ratings. Conversely the battleships were assigned a higher percentage of their authorized apprentices in pay grades E-1 through E-4.

Table 1: On-board Percentages of Gunners Mates and Fire Controlmen Compared to Authorized Levels at Deployment

	<u>Iowa</u>	<u>Battleships</u>	<u>Ship sample</u>
	----- (percent) -----		
All Supervisors	92	93	101
Gunners Mates			
Supervisors	73	77	100
Journeymen	88	82	135
Apprentices	94	92	73
Fire Controlmen			
Supervisors	92	88	120
Journeymen	89	92	128
Apprentices	106	109	85

The impact of manning for gunners mates aboard the Iowa was highlighted at the time of the explosion. In turret II, two of the three journeyman-level gun captain positions, normally E-5s, were filled by E-4 apprentices. The center gun captain was the only journeyman gun captain. All three of the gun captain positions in turret I were filled by E-4 apprentices, and a journeyman was

filling the supervisory turret captain's position, which is normally filled by an E-7.

Chief of Naval Personnel officials told us that they had difficulties in filling billets on battleships. The officials also said that the ship sample had excess gunners mates and fire controlmen at the journeyman and supervisory levels because these personnel were promoted at higher rates. Also, personnel promoted during a deployment are not reassigned, even though on-board excesses develop. Since the school terms for those ratings on the ships in our sample are longer than those for the 16-inch-related schools, the personnel tend to be a higher grade when reporting to ships of the types in our sample.

The officials also noted that personnel who are assigned to the battleships and who reenlist, frequently request duty elsewhere to enhance their promotion opportunities by gaining practical experience in more common gun systems. Similarly, they prefer to attend schools for other gun systems to enhance their promotion opportunities and, because the other guns have newer electronic technology, to enhance their prospects for future civilian employment. Sailors aboard the Iowa expressed similar views to us.

Battleship Personnel Fare
Worse in Advancement Opportunities

As of December 1989, battleship officers had been selected at a lower rate, compared to officers in the sample of other surface warfare ships, for leadership positions such as executive officer and commanding officer. Only 23 percent of the commanders serving on battleships were considered qualified to be a commanding officer compared to 88 percent of the commanders on the sample ships. For lieutenant commanders being considered to serve as executive officers, the figures were more comparable--53 percent of battleship lieutenant commanders were considered qualified compared to 56 percent on the sample ships. However, the Iowa had only 25 percent who were considered qualified.

Enlisted personnel on battleships also fared worse during the March 1989 promotion cycle than did personnel aboard other ships in our sample. Battleship personnel overall scored lower on the promotion tests, a key element in the promotion eligibility process. The failure rate for gunners mates and fire controlmen on battleships and for Navy-wide personnel were similar. However, the battleship gunners mates and fire controlmen failure rates of 11 and 6 percent, respectively, were significantly higher than the ship sample's failure rates of 0 and 1 percent, respectively.

Among those who passed the test, fewer battleship personnel in the gunners mate and fire controlman ratings were selected for

promotion. For example, 53 percent of the gunners mates on board the battleships were promoted compared to 65 percent for the ship sample and 58 percent Navy-wide. For fire controlmen, the results were 8 percent for the battleships, 15 percent for the ship sample, and 13 percent Navy-wide.

Higher Rate of Disciplinary Actions

During fiscal year 1989, battleship personnel experienced a higher rate of disciplinary actions, including nonjudicial punishments (NJPs), courts-marital, and punitive discharges. For example, the battleships' NJP rate per thousand (195) was approximately 27 percent higher than the ship sample rate (154 per thousand) and 183 percent higher than the Navy-wide rate (69 per thousand). While the Iowa had the lowest rate (174 per thousand) among battleships, its NJP rate was still 150 percent higher than the Navy-wide rate. Similar results were noted for the battleships' and the Iowa's courts-martial and punitive discharge rates.

About 70 percent of the battleships' personnel are in grades E-1 through E-4. Battleships also have a lower level of supervisory personnel than the ships in our sample. Navy officials said that these factors may have contributed to the higher disciplinary rates aboard the battleships.

PROBLEMS WITH 16-INCH GUN TRAINING

The adequacy of training on the Iowa became an issue because the Navy's incident investigation report on the explosion said that unqualified personnel were manning the turret. However, the former Commanding Officer of the Iowa said that the crew was trained, but that the records were not up-to-date. Since the training records were destroyed in the explosion, never existed, or have not been located, we are unable to reconcile this conflict. Additionally, the Navy had not approved a training plan for the battleship class, and the advanced training school had limited hands-on training aids for operation and maintenance instruction.

While the Iowa had the framework of a personnel qualification standard (PQS) program for the personnel assigned to its turrets, insufficient records were available after the explosion to provide an overview of each individual's qualifications. The Navy's incident investigation report criticized the Iowa for a lack of documentation, especially service record entries, for determining the qualifications of assigned personnel. We found, however, that service record entries, while preferable, were not required until personnel were transferred to another command. The Iowa and its superior command now require such entries upon completion of assigned PQS tasks. During our review of service records for selected turret positions aboard the Iowa in November 1989, we found that the new requirements had been implemented.

Using reconstructed data, Iowa officials attempted to evaluate the qualifications status of the personnel assigned turret positions on April 19, 1989. Personnel were considered to be "operationally qualified" based on the number of gun fire exercises and training drills in which they had participated. While the information they developed indicated that the personnel assigned in the turrets were experienced, we found weaknesses in the analysis. In our opinion, the crew's proficiency cannot be verified because the information merely shows that the crew members were assigned in the turret during the exercises and drills but does not document what duties they actually performed. For example, one person was classified as operationally qualified, even though he was serving in his assigned role for the first time on April 19, 1989. In another case, the analysis did not include the status of one individual serving in turret II.

The Iowa's turret II was authorized five personnel who were required to have completed training at the Navy's formal school for 16-inch gunners. However, on the day of the explosion, only two of the positions were filled with individuals who had attended the school.

The Navy's formal training program for 16-inch gun operations and maintenance has weaknesses. The gunners mates we met with aboard both the Iowa and the New Jersey were very disappointed with the Navy's formal school for 16-inch gunners because it lacked actual

turret equipment, and they believed it offered little practical instruction. The crews believed that they learned their jobs through on-the-job training. The school's internal evaluations and the Navy's draft training plan for the battleships also noted problems caused by the lack of training aids. Our visits to the school confirmed that limited hands-on training was being provided due to the lack of training aids. We noted no improvements in the content of the course or available training aids since the explosion. While the Navy developed a draft training plan to improve the 16-inch training courses in September 1989, the plan still awaits final approval and implementation.

BATTLESHIP MISSIONS

We reviewed the Navy's concept of battleship employment--what the ships' wartime missions are and how they are scheduled for peacetime deployment. My remarks will be brief since much of the detailed information is classified.

While the battleships are very capable weapons platforms and have been included in deployment schedules and operational plans, emerging circumstances limit their utility. The battleships were reactivated to alleviate existing force structure shortfalls and to help meet the 600-ship goal using existing platforms. With their variety of guns and missiles, the battleships provide an imposing array of firepower. The Tomahawk missiles give them a significant

capability for attacking land targets and other surface ships. The Harpoon missiles also contribute to the battleships' capability to operate against hostile surface ships. The battleships' 16-inch guns are the best source of naval surface fire support for an amphibious assault and are, in fact, the only guns remaining on Navy ships that are larger than 5 inches. Navy officials said that when compared to air support in an amphibious operation the 16-inch guns, within their range limitations, can deliver more firepower under a wider variety of weather conditions. Because of its imposing size and configuration, the Navy believes a battleship's presence can be a strong deterrent in a third-world scenario.

While the battleships' Tomahawk and Harpoon missile capability is imposing, it is not unique within the Navy. Many other Navy vessels, submarines as well as surface ships, carry those same weapons. Also, the battleships' contribution to future amphibious warfare may be limited. The 16-inch guns' current maximum range of just over 23 miles impairs the ships' ability to provide effective naval surface fire support within the context of an "over the horizon" amphibious assault--one launched from 25 to 50 miles offshore and extending far inland. This range limitation has been noted in Navy documents.

Furthermore, with only two battleships, operating and personnel tempo restrictions will limit future deployments. Current policies, for example, preclude a ship from deploying for 12 months

after it returns from a 6-month deployment. Also, the battleships require a crew of about 1,500 compared, for example, to a crew of about 360 on an Aegis cruiser. Finally, reducing the number of battleships to two, especially with one homeported on each coast, will compound the manning and training problems discussed earlier and further limit availability.

Budget constraints led to the decision to decommission two of the four battleships. The battleships are costly to maintain and difficult to man and, until the ships' unique contributions in the Middle East can be evaluated, mission-related questions concerning their contributions remain.

For these reasons, we are recommending that the Secretary of Defense direct the Secretary of the Navy to reevaluate the battleships' utility in the light of known constraints and limitations and, unless current Middle East operations convincingly demonstrate their unique utility, direct that the Secretary of the Navy decommission the Missouri and the Wisconsin.

Madame Chair, this concludes my prepared remarks. I would be happy to answer any questions.