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Procurement of the AOE-6

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Commander
Joseph C. Bastian
U.S. Navy

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Procurement of the AOE-6

"Navy Deal With Contractor Leaves Taxpayers With Bill"

This was the title of an article, by staff writer Ralph Vartabedian, published in the Los Angeles Times on June 16, 1992. It detailed the account of the Navy's handling of a ship construction contract for the AOE-6 Class supply ship and the financial problems and managerial decisions that were made by both the Navy and the defense contractor involved in this procurement program.

The decisions which were made regarding the construction of the lead ship (AOE-6) and the subsequent awards for the three follow-on ships of the same class, have sparked controversy and speculation about the government's involvement in assisting defense contractors and the political decisions which arise out of the issues of saving jobs and bolstering a sagging economy.

The Case Study which follows details the events leading up to the Navy's decision to build this new ship class and the resultant procurement program for these vessels. It delineates the chronology of these events, which span more than a decade, and provides insight into the complexity of developing a major weapons system through the current government acquisition process.

Joseph C. Bastian
Commander
U. S. Navy

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THE MAJOR PLAYERS

NAVY

Chief of Naval Operations (CNO)

Assistant Secretary of the Navy (Shipbuilding & Logistics) ASN(S&L)

Assistant Secretary of the Navy (Financial Management) ASN(FM)

Assistant Secretary of the Navy (Research, Development & Acquisition) ASN (RD&A)

Operational Navy Staff (OPNAV)

- OP-03 Surface Warfare Sponsor

- OP-04 Logistics Sponsor

Naval Sea Systems Command (NAVSEA)

- PMS-383 the Program Manager

Supervisor of Ships (SUPSHIP)

- SUPSHIP San Diego

Navy Comptroller (NAVCOMPT)

Naval Center for Cost Analysis (NCA)

DEPARTMENT OF DEFENSE

Defense Contract Audit Agency (DCAA)

Office of the Secretary of Defense Comptroller (OSD COMPT)

CONGRESS

House Armed Services Subcommittee (HASC)

Senate Armed Services Subcommittee (SASC)

INDUSTRY

Bethlehem Steel Corporation

Morrison - Knudsen

- Parent Company of NASSCO

Avondale Shipyard

Advanced Marine Engineering

Cincinnati Gear

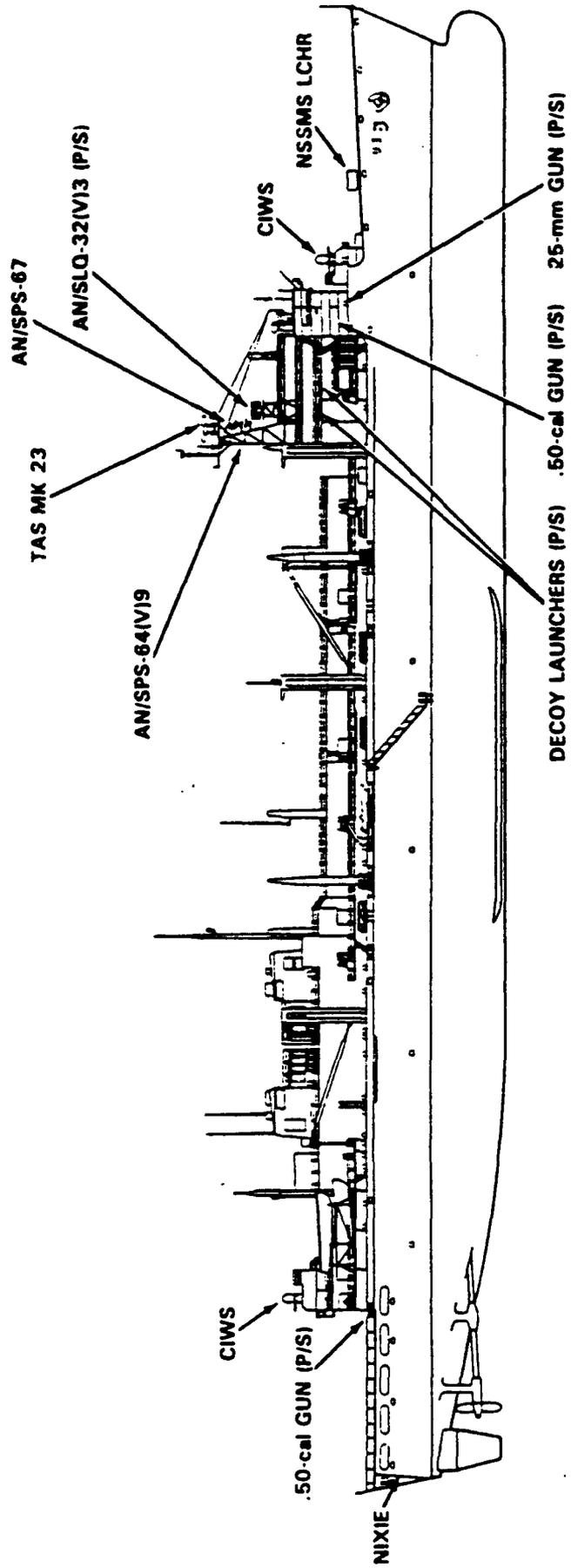
National Steel and Shipbuilding Company (NASSCO)

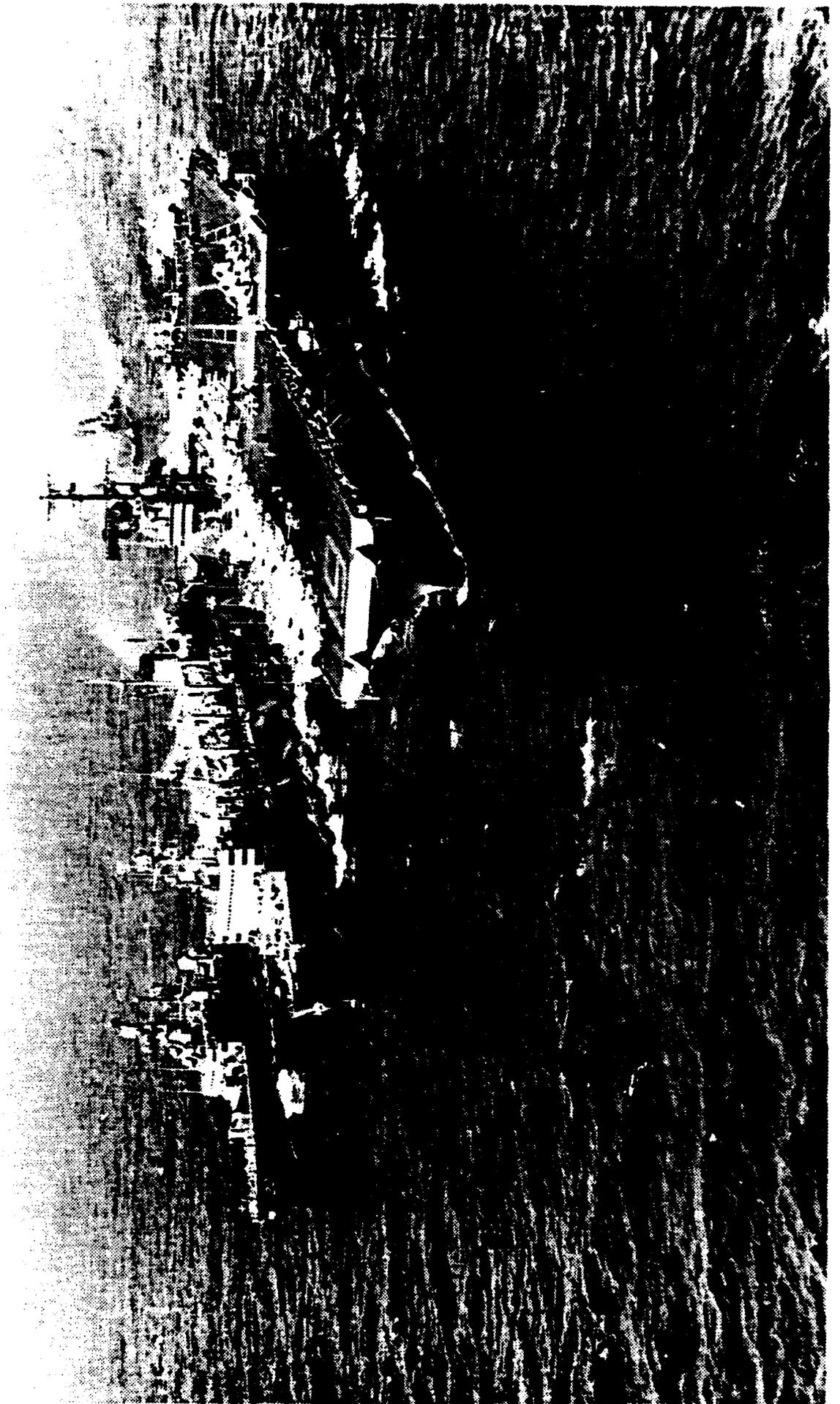
ACRONYMS

AE	Ammunition Ship
AOE	Fast Combat Support Ship
AOR	Replenishment Oiler
ARB	Acquisition Review Board
ASN(FM)	Assistant Secretary of the Navy (Financial Management)
ASN(RD&A)	Assistant Secretary of the Navy (Research, Development & Acquisition)
ASN(S&L)	Assistant Secretary of the Navy (Shipbuilding & Logistics)
BAA	Baseline Area Appraisal
CONREP	Connected Underway Replenishment
CPR	Contract Problem Reports
CPS	Collective Protection System
CRLCRMP	Computer Resources Life Cycle Management Plan
CRP	Controllable Reversible Pitch Propeller
C/SCSC	Cost/Schedule Control System Criteria
CVBG	Carrier Battle Group
DAC	Days After Contract Award
DCAA	Defense Contract Audit Agency
FYDP	Future Years Defense Plan
GFE/I/M	Government Furnished Equipment/Information/Material
HMR	Headquarters Modification Request
ICE	Independent Cost Estimate
INSURV	In-Service
ILSP	Integrated Logistics Support Plan
LRG	Logistics Review Group
MCCS	Machinery Centralized Control System
NAVCOMPT	Navy Comptroller
NAVSEA	Naval Sea Systems Command
NCA	Naval Center for Cost Analysis
NDCP	Navy Decision Coordinating Paper
NPDM	Navy Program Decision Meeting
OPTEVFOR	Operational Test & Evaluation Force
OR	Operational Requirement
OT&E	Operational Test & Evaluation
PEM	Program Endorsement Memo
PM	Program Manager
PMP	Program Management Proposal
POA&M	Plan of Actions & Milestones
POM	Program Objectives Memorandum
QPR	Quarterly Program Review
RAR	Readiness Assessment Review
REA	Requests for Equitable Adjustments
RFI	Requests for Information
RFP	Request for Procurement
ROM	Rough Order of Magnitude
RRG	Reversing Reduction Gear
SAR	Subsequent Application Review
SCA	Ship Construction Account
SCIB	Ships Characteristics Improvement Board
SCN	Ship Construction Navy (Appropriation)
SHAPM	Ships Acquisition Project Manager Meeting

ACRONYMS

SUPSHIP	Supervisor of Ships
TEMP	Test & Evaluation Master Plan
TLR	Top Level Requirements
UNREP	Underway Replenishment
VERTREP	Vertical Replenishment





GENERAL INFORMATION

FAST COMBAT SUPPORT SHIP (AOE-6)

BACKGROUND

The very foundation of the Navy's ability to perform its missions of power projection and sea control resides in the carrier battle group (CVBG). The capability of the battle group, whether in peacetime or wartime, can be severely curtailed however, by logistics constraints. The inability or failure to receive spare parts, fuel, ammunition or other support items can reduce the battle group's fighting ability and sustainability at sea. It is therefore imperative that the battle group be logistically supported while underway. The logistics ship which fulfills this essential mission is the station ship. These station ships - either Fast Combat Ships (AOEs) or the smaller, slower Replenishment Oilers (AORs) - carry the three basic commodities of fuel, ammunition, and fleet stores required to support the battle group and have the ability to transfer these products simultaneously. These multi-commodity ships are required to stay with the battle group at all times in order to be immediately available when needed and must therefore be able to defend themselves and survive in a combat environment.

In a review conducted by the Navy in 1981, it was determined that one station ship was needed for each carrier battle group. This determination, when applied to the number of carriers and station ships existing at that time, as well as the projected ship construction build-up to 15 carriers by 1990, resulted in a requirement for an additional four station ships. It was also realized that this deficiency would be exacerbated further as the existing station ships reached the end of their useful service lives and became candidates for decommissioning. As a result, the need for a new station ship was deemed an urgent requirement by the Navy. After considering various alternatives (including a Service Life Extension Program (SLEP) for the existing station ships) to meet this

requirement, the Navy chose a new construction AOE program (AOE-6), rather than an AOR, because of the AOE's superior capacity, speed, survivability and transfer capability.

MISSION /NEEDS STATEMENT

With the decision made to develop the new AOE-6 class ship, the Navy then had to define the program concept and establish the basic parameters and requirements that the ship must meet.

Operational Need

By 1982, the Soviet Navy had developed into a mature seapower capable of global operations. Further, this global capability carried with it the vision that the Soviets had in mind a much more ambitious plan for power projection and a broad array of tasks involving peacetime support of state policy, wartime tasks of sea lines of communications (SLOC) interdiction, and if necessary, the destruction of enemy naval forces. This power projection plan supported the assessment that the Soviets were willing to make a commitment to continued development and acquisition of significant naval forces capable of presenting a threat to the United States - or any other naval force - anywhere in the world. The capability to counter this threat was the carrier battle group and its ability to sustain itself for prolonged periods at sea through the use of underway replenishment (UNREP) by station ships.

Operational Concept

The new class station ship was conceived as a one-stop shopping center for the CVBG, capable of receiving, storing and transferring fuel oil, ammunition, dry provisions, consumable supplies, and specialized repair/maintenance parts. It had to be able to

receive these products directly from pierside services or shuttle ships from foreign ports for ultimate redistribution to the CVBG, using connected underway replenishment (CONREP) and/or vertical replenishment (VERTREP) using its embarked helicopters. Because of the requirement to operate with the CVBG in all threat areas, times and locations for underway replenishments would be more flexible. Acting as a single source, multi-product carrier, the AOE would significantly reduce the vulnerability of individual ships of the battle group by reducing the number of replenishments and the amount of time spent alongside.

Capabilities

The multi-product replenishment ship concept mandated unique design innovations and flexibility not previously achieved in current single role replenishment vessels. The AOE-6 was required to have the fuel oil, ammunition and dry cargo carrying capability at least equal to the older AOE-4 class. In addition, the design had to insure the maximum safety in stowage and handling capabilities for these products. Further, the design had to allow the main deck cargo and ammunition stowage spaces to be interchangeable to facilitate various mixes of aviation and surface ordnance. Similarly, cargo fuel tank configuration required a design which would permit the ship to easily change its' fuel stowage requirements to accommodate varying percentages of either diesel fuel or aviation jet fuel, as well as allowing for a reasonable degree of trim to be maintained in loading conditions other than full load or full ballast.

Performance and System Parameters: In order to meet its' mission requirements, the AOE-6 had to meet the following broad specifications:

- Be capable of sustained speeds of 26 knots and have the capability to conduct CONREPS at speeds up to 16 knots .
- Incorporate transfer at sea facilities to permit simultaneous

replenishment of two ships alongside and one ship by helicopter.

- Cargo handling facilities/equipment that permit efficient and expeditious loadout in port and consolidation of cargo loads from other ships while underway.

- Reduce manning and maintenance requirements through the incorporation of automation advances in main propulsion, auxiliary and cargo handling equipment, replenishment stations, bridge, communications center, and other control spaces.

- Incorporate integrated command, control and communications capability to permit the AOE-6 to operate with combatant task forces in all threat areas.

- Be equipped with a limited anti-missile, anti-surface, anti-torpedo defensive capability. No offensive capabilities are required.

- Incorporate those same survivability features found on combatants to include: minimum radiated noise; Collective Protection System (CPS) for manned spaces; chemical, bacteriological and radiation (CBR) decontamination capability for cargo before transfer; grade A shock hardness; electromagnetic wave propagation (EMP) protection to 50,000 volts/meter; and thermal protection to equivalent levels of blast hardness.

- Provide for a maintenance plan to include onboard capability; organizational - level corrective, preventive and facilities maintenance and own unit support.

- Provide for a day/night VERTREP capability in conditions up to and including sea state 5.

- Include state-of-the-art energy conservation measures that are compatible with the ship's mission areas in the ships' design and development to achieve minimum life cycle costs.

- Use construction methods that comply with the standards for combatants.

- Consider the use of commercial equipment and practices in order to take advantage of standardization in construction methods and techniques but only to the point where such practices do not degrade readiness.

- Allow for alternatives to new ship design through the acceptance of minimum modifications to the AOE-4, however, in order to meet sustained speed requirements, alternatives to the AOE-4 conventional propulsion plants would be considered along with their associated comparisons of cost and risk.

Operational Employment

The AOE-6 was required to operate with the CVBG conducting day and night replenishment operations in conditions up to and including sea state 5. The ship was expected to operate in environmental conditions ranging from tropical to arctic as well as in all threat areas expected of the CVBG.

Manpower and Personnel

It was anticipated that the AOE-6 would be able to accommodate 667 personnel (broken out by 40 officers and 627 enlisted) with actual manning estimated at 603. Special attention was to be given to providing personnel with the necessary skills to maintain installed systems, as well as providing equipment that could be operated easily by typical fleet personnel when the ship was deployed.

Principal Warfare/Mission Support Area

The AOE-6 was designed to provide support, logistics and underway replenishment mission requirements.

ACQUISITION STRATEGY

AOE - 6 PROGRAM MANAGEMENT PLAN

With the Mission/Needs Statement outlining the general characteristics and specifications for the new ship class, the next step for the Navy in 1981 was the development of a Program Management Plan that would oversee the AOE-6 Program from design through delivery. To begin this process the following organization was established:

- Program Manager: NAVSEA (PMS-383)
- Program Sponsor: OPNAV (OP-03)
- OPNAV Program Coordinator: OP-375
- Development Coordinator: OP-982
- Navy Secretariat Coordinator: ASN (S&L)

Briefly summarized, the overall plan developed by the Program manager had 5 stages: (1) a feasibility study which would validate the requirement for the new ship class, (2) a preliminary design stage where NAVSEA would draft the ship's plan, evaluate alternative proposals for ship systems, and assess different design options based on funding availability, (3) a contract design stage which included a pre and post-Request for Procurement (RFP) phase; the pre-RFP would hold design reviews with industry and government representatives, develop acquisition strategies and issue the RFP; the post-RFP would evaluate the bid solicitations and make a source selection, (4) a contract award stage for the lead ship (AOE-6) which included the actual construction and delivery of the lead ship, and (5) an option ship award stage which would allow for subsequent contract award and construction of AOE's 7, 8, and 9.

Feasibility Study Phase

A feasibility study for the AOE-6 was conducted in 1981 to determine the validity of the concept. A command review of this feasibility study was held on 22 June 1982 to assess the status and adequacy of the design before forwarding the study to operational

Navy staff (OPNAV) and before much work had been done on the preliminary design. The results of the review found that the design as presented satisfied the requirements and that preliminary design work should proceed. Outstanding issues stemming from the review included:

- What problems would arise when converting cargo tanks to fuel tanks?
- What would be the correct mix between automation and manning targets?
- Electric load data had not been considered in the design.
- What would the configuration of the UNREP Suite be?
- The imposition of the new 84db noise requirements for radiated and airborne noise were considered too stringent a design criteria.
- In order to reduce costs, standardization of hardware for UNREP and elevator equipment should be considered in the design phase.

Preliminary Design Phase

The Naval Sea Systems Command (NAVSEA) held a meeting in March 1983 to discuss preliminary cost estimates for different variations of the AOE-6. These variations included the basic AOE-6 as originally conceived (\$888M), gas turbine (\$898M) and medium speed diesel (\$937M) variants, high tensile steel construction (\$878M) variant, and a up-graded AOE-4 class (\$818M) variant. A follow-on meeting with OPNAV representatives in April 1983 to discuss presentations for the Ship Characteristics and Improvement Board (SCIB) found that the OPNAV representatives believed that the lead ship cost of \$888M was too high and would be very difficult to sell to senior level Navy decision makers and Congress. While OPNAV sought cost reductions, NAVSEA indicated that such reductions would necessitate corresponding reductions in capacities but that NAVSEA could not arbitrarily reduce requirements. As a consequence OPNAV provided the following parameters within which reductions could be investigated and priced:

- Speed, communications, weapons and shock specs were not to be reduced.
- Reduce the length of the ship by the size of one hold.
- Reduce bunker fuel capacity to a 6,000 mile endurance load.
- The Collective Protection System (CPS) could be deleted in its entirety.
- Reduce blast and thermal protection to that of an AOE-4.
- Reduce habitability below 1979 criteria but remain above 1963 criteria.
- Reduce sustained speed capability to 22 knots.

The intent of these reductions in capability was to decrease the overall cost but still retain the AOE concept and design - in other words OPNAV didn't want another AOR or AE class ship.

NAVSEA, working within the parameters described above, was able to reduce the overall estimated cost of the lead ship to between \$825M and \$835M. Specifically this resulted in the following actions:

- Ship length was reduced 55 feet by eliminating one hold.
- Cargo ammo was reduced from 2400 to 1800 tons.
- Cargo fuel was reduced from 177K to 167K barrels.
- Cargo reefer capacity was reduced from 500 to 400 tons.
- Endurance fuel capacity was reduced from 4424 to 2654 tons.
- The Collective Protection System (CPS) was eliminated.
- Two UNREP stations were deleted.
- Three elevators and one pallet conveyor were deleted.
- One of two emergency diesel generators was deleted.

While these reductions met the goal of reducing the original cost of \$888M, OPNAV

believed that the SCIB might request consideration of an alternative AOE with an estimated cost of around \$800M. This would be in keeping with the Navy Comptroller (NAVCOMPT) mark on the Program Objectives Memorandum (POM-85) for the lead ship in FY86 which was down to \$800M. NAVSEA, with authorization from OPNAV, undertook the following additional reductions to achieve this alternative goal:

- Eliminate the channel finder.
- Eliminate one TAS Mk-23 radar system.
- Eliminate one NATO Seasparrow platform.
- Eliminate two Close in Weapon System (CIWS) platforms.
- Eliminate the AN/SLQ-32 system.
- Eliminate the shock requirements.

The results of these last reductions brought the lead ship cost down to between \$760-770M - which was sufficient to meet the goal of \$800M - but in so doing, removed all of the ship's defensive capabilities!

The SCIB presentation was made on 12 May 1983 and resulted in the approval of the "downsized" (\$825-835M) AOE with a gas turbine propulsion plant instead of the original steam plant. While the recommendations of the SCIB had not been forwarded to the Chief of Naval Operations (CNO) for final approval, it was agreed that any further delay would negatively impact the program and jeopardize the schedule, consequently NAVSEA was authorized to start the contract design effort using the preliminary characteristics already presented.

Contract Design (Pre-RFP)

The CNO approved the SCIB's recommendations on 14 July 1983 with one caveat;

that this ship class be afforded the same survivability characteristics as the other ships it would be supporting in the CVBG. This meant retaining the shock protection and some form of the Collective Protection System (CPS) for the downsized AOE-6. Additionally, he established a target price of \$815M for the lead ship in FY86 and authorized NAVSEA to commence contract design.

In a letter to the SCIB in October 1983, NAVSEA presented a case for reversing the decision to downsize the AOE by arguing that the original cost estimates for the reduction initiatives had been refined from those presented at the 12 May SCIB presentation which now resulted in a revised overall cost estimate of \$815M. Additionally, further cost savings could be expected from dedicated efforts to preclude "gold plating" and requirements "creep" as well as competition in the marketplace and lower labor costs and material inflation than previously anticipated. All of these factors, NAVSEA argued, would allow construction of a full size AOE including the CNO's requirements plus the 55' hold, elevators, and replenishment stations previously deleted. Further justification for this request was substantiated by indicating the construction of a full size AOE would preclude Fleet concerns over the ability of a downsized ship to meet their demands as well as a future "jumboizing" action similar to that under consideration for the AO - 177 Class.

On 25 November 1983, an executive session of the SCIB was held to discuss the potential of reversing the decision on a downsized AOE based on the NAVSEA argument discussed above. The result of this meeting concluded that despite the predictions by NAVSEA that a full sized AOE could be built for the target price of \$815M, the total cost of the ship must be considered in the overall strategy of the Ship Construction Navy (SCN) Appropriation and that continued pressure to reduce the defense budget could not

be ignored. Consequently, the downsized AOE was "good enough" and the previous decision of 12 May 1983 was upheld.

The procurement strategy for the AOE-6 Class was issued by NAVSEA on 28 February 1984 and is summarized as follows:

- The design would be done in-house at NAVSEA.
- Industry would be given the opportunity to review the contract design.
- It would be a competitive award.
- The lead ship contract would have options for AOE's 7-9.
- Construction of the lead ship would commence in FY87 with an option for a follow-on ship in FYs 89, 90, and 91 (no ship was planned for FY88).
- The contract would be a fixed price incentive contract with escalation.
 - 50/50 government/contractor cost sharing for the lead ship
 - ceiling set at 130% of target for lead ship and 125% for follow ships
- There would be liquidated damages charged for excessive weight.

A Program Management Proposal (PMP) issued from NAVSEA in March 1984 showed a significant change in the program/budget profile for POM-86 funding requirements over the previously approved January 84-FYDP. Specifically, this change reduced the lead ship cost from \$815M to \$745M. The rationale for this price change (reduction) was attributable to (1) \$53M for ship size reduction (1 hold); (2) \$20M for a gas turbine vice steam propulsion plant; (3) \$5M for miscellaneous design refinements; and (4) \$65M for net lower labor, material cost projections and Program Manager growth adjustment.

The approved Top Level Requirements (TLR) for the AOE-6 Class were issued on 25 October 1984 by OPNAV and were applicable with the FY87 Shipbuilding and Conversion Program. The highlights of these requirements were (1) a lead ship target cost of \$815M, (2) a propulsion plant centered around four gas turbine engines with reversing reduction gears (RRG), and (3) a Collective Protection System (CPS) for the living, command control and communication spaces, plus a partial CPS for the main propulsion spaces.

In December 1984 OPNAV requested that NAVSEA conduct a review of the AOE cost estimates during development of POM-87 funding profiles to ensure affordability of the current design. In making this request, OPNAV specifically asked that consideration be given to (1) reducing the shock requirements, (2) use of commercial specifications and standards in non-mission areas, (3) a 10% reduction in accommodations, (4) a reduction in cargo capacity and (5) current market conditions. The resultant figures would be used in developing the preliminary cost estimates for the Afloat Logistic Baseline Area Appraisal (BAA).

NAVSEA conducted four Contract Design Reviews over the period 21 May - 02 July 1985 in which six shipbuilding firms participated. The purpose of these reviews was to allow the potential bidders the opportunity to provide comments, recommendations and ask questions on specific drawings and specifications associated with the AOE design. Of the 216 written comments that were received by NAVSEA in response to these reviews, 117 were concurred with and were incorporated in the design.

An Acquisition Review Board (ARB) annual review was held on the AOE-6 program on 18 October 1985. The board made the following determinations:

- The contract design and industry review were complete.
- The program could proceed to the next milestone - issuance of the Request for Procurement (RFP) in April 1986.
- The program was on schedule. Specifically:
 - The In-Service design review was scheduled for November 1985.
 - The RFP was scheduled for April 1986.
 - The lead ship delivery was planned for February 1991.
- Current funding for RDT&E and SCN was adequate for the program.
- The Program Manager reported he was understaffed.
- Logistics was on track - the Program Manager would have to obtain the Integrated Logistics Support Plan (ILSP) approval prior to the Logistics Review Group (LRG) scheduled for February 1986.
- The Operational Requirements (OR) and Top Level Requirements (TLR) were approved.
- The acquisition strategy was approved.
- Three technical risk areas were identified:
 - The reversing reduction gear (alternative is controllable reversible pitch propeller) would be the first of its kind on a Navy ship.
 - The air-borne noise requirements of 84db were the most stringent requirement of this type imposed on a surface ship to date.
 - The Collective Protection System (CPS).
- The AOE-6 shock test had not been budgeted and would have to be completed in order to comply with OPNAV policy.

In addition to the ARB, NAVSEA and the Program Manager conducted two separate design reviews to ensure affordability, minimize production costs and

incorporate new concepts in ship design and construction. These two independent reviews were conducted by Fleet representatives and technical personnel from NAVSEA, and In-Service (INSURV) review teams, all of whom addressed fleet concerns and lessons learned from previous ship design and construction programs. Of the 100 comments made as a result of these independent design reviews, 84 were incorporated into the AOE design. Additionally, NAVSEA incorporated those cost saving suggestions addressed in a separate review by an independent foreign firm - Advanced Technology, Inc. - called a Producibility Review - and was bringing the author over from Sweden to ensure that all aspects of his review had been interpreted correctly.

A Navy Decision Coordinating Paper (NDCP) was issued on 5 March 1986 with the following guidance:

- The downsized AOE design with a gas turbine propulsion plant and reversing reduction gear would be the design selected.
- There would be a two phased acquisition strategy. Under Phase I, NAVSEA would conduct a contract design with shipbuilder (industry) review; and in Phase II, issue an RFP with proposals submitted for a fixed price incentive award for the lead ship and a 3 ship follow-on option.
- There would not be an Operational Test and Evaluation (OT&E) conducted by the Operational Test and Evaluation Force (OPTEVFOR) nor would there be a Test and Evaluation Master Plan (TEMP).

NAVSEA held a pre-solicitation meeting with shipbuilders on 25 March 1986 and the acquisition plan was signed and approved by the Assistant Secretary of the Navy (Shipbuilding and Logistics) on 16 April 1986. Additionally, NAVSEA and the Program Manager held meetings in the May-June 1986 time frame to address modifications to the

design package and ensure that every possibility and source had been considered in making the package as complete and as accurate as possible prior to bidding by the shipbuilders.

NAVSEA issued the Request for Procurement (RFP) on 10 June 1986 - only one month later than the original schedule called for.

NAVSEA and the Program Manager spent the remainder of 1986 answering questions from bidders, issuing amendments to the RFP (to incorporate specific modifications to the design package) and responding to budget marks imposed by the House Appropriations Subcommittee (HASC), which cut funding for the lead ship by \$113M from \$612.7M to \$499.7M. Despite a combined reclama effort by NAVSEA, the Program Manager and the Shipbuilders Council of America, a decision was reached by the HASC and Senate Appropriations Subcommittee (SASC) (in joint committee) in October 1986 which retained the AOE lead ship in 1987 but reduced the funding by the previously issued mark of \$113M. NAVSEA believed that changes to the Top Level Requirements would be required in order to reach the \$499.7M figure, but could not provide details until the AOE pricing proposals were received.

Contract Design (Post-RFP)

Pricing proposals were received from four shipbuilders on 31 October 1986 and source selection - by the NAVSEA price analysis team - began on 3 November with an estimated contract award date of 24 December 1986. The four proposals received were:

- National Steel and Shipbuilding Company (NASSCO): \$290.1M / \$883.8M (total for the program)
- Avondale Shipyard: \$328M / \$1,003M

- Penn Shipyard: \$356.2M / \$1,123.8M
- Bethlehem Steel Corporation: \$417.9M / \$1,225.1M

The NAVSEA price analysis team reported their findings on 9 January 1987. They concluded that (1) 3 shipbuilders underbid the NAVSEA low estimate of \$344.9M / \$1,140.8M; (2) 1 shipbuilder overbid the NAVSEA low estimate; (3) NASSCO underbid (at \$785.7M total target cost) and (\$765.5M for ship design and construction); and (4) NASSCO would ultimately lose approximately \$28.2M due to their anticipated production learning curve being overly optimistic and the cost of materials estimate being extremely low.

The AOE - 6 Program had reached a major decision point - which shipbuilder would be selected for contract award? To date (1981 - 1986) the program had: •been validated and approved by senior Navy leadership •undergone extensive design and cost evaluations •approved operational and top level requirements •completed contract design reviews by industry and government •approved funding from Congress •an approved acquisition strategy, and •met required acquisition milestones

After a review of the findings of the price analysis team, the AOE-6 contract was awarded to NASSCO on 23 January 1987 for \$290M.

Lead Ship Award

In February 1987, NASSCO requested the Cost/Schedule Control System Criteria (C/SCSC) Subsequent Application Review (SAR) be held 180 days after the contract award in lieu of a re-validation review 90 days after contract award. Approval of the contractor's C/SCSC was critical because without approval of this system he was prevented from proceeding to the next program milestone. Further, the lack of an

agreed baseline, as represented by the C/SCSC, precluded accurate tracking of future contractor performance.

In April, NASSCO signed a contract with Cincinnati Gear to manufacture the reversing reduction gear (RRG). Note: the reduction gears are a critical element in the overall construction process of a ship and are "long-lead" items for purposes of production planning and delivery/installation.

NAVSEA completed the implementation review of NASSCO's C/SCSC in June 1987 and found that NASSCO was not using the previously accepted management system. This prompted a meeting with the Assistant Secretary of the Navy (Shipbuilding and Logistics) (ASN(S&L)), who recommended that a re-validation review be conducted as well as a review of the program milestones already established.

The first Contract Problem Report (CPR) on the RRG was received by NAVSEA on 29 December 1987.

The Acquisition Review Board's annual review was held on 29 January 1988. The board submitted the following report on the AOE-6 Program:

- The program was on schedule with actual construction beginning in April 1988 and delivery of the lead ship scheduled for April 1991.
- The next major milestone for follow-ship authorization would be Milestone III scheduled for September 1988.
- The program manager indicated that a potential for delay existed due to the extremely large amount of interrogative correspondence initiated by the shipbuilder.
- A serious impediment to the program was the actual homeport location

which had not been named and the associated MILCON, if required, could not be completed by the required date.

- Personnel shortfalls still existed at the Program Office and at the Supervisor of Ships (SUPSHIP) San Diego, Ca. (the location of NASSCO).

- Due to flaws in the ship's contract design and specifications a large number of contractor Requests for Information (RFI) and Contract Problem Reports (CPR) had been received by NAVSEA and the Program Manager but could not be responded to in a timely manner due to the personnel shortfalls previously identified.

- A Production Readiness Review Plan was to be issued in August 1988 but the Program Manager had indicated that a labor dispute at the yard had adversely affected worker productivity.

- Technical risks remained as previously identified - the Reversing Reduction Gears, airborne noise reduction and the Collective Protection System.

Construction of the AOE-6 began on 22 June 1988.

On 30 June 1988 SUPSHIP San Diego requested the Defense Contract Audit Agency (DCAA) conduct an audit of NASSCO's financial status to determine if the contractor was financially able to meet his commitments for both existing government contracts and future awards (in this case the follow-on AOE-7 contract). The findings of the audit, released on 23 September 1988, indicated that NASSCO had been experiencing serious financial deterioration since 1985 and that the likelihood of bankruptcy in the near future was probable. Further, NASSCO's parent company, Morrison-Knudsen had been providing cash to NASSCO in order to meet current obligations and that the Board of Directors for Morrison-Knudsen had not made any long range commitments to finance NASSCO. The report went on to say ... "that it is highly questionable that NASSCO will

be capable of meeting all of its financial requirements in a timely manner to perform on existing and proposed contracts, unless it receives the parent company's firm and definite commitment for continued support for an extended period of time, or unless other sources of financing are obtained."

The Program Manager requested an exemption from the Production Readiness Review based on NASSCO's preparation, organization, and capability to meet the contract requirements. Specifically, this request was based on a number of items identified by the Program Manager under broad categories such as Product Design, Industrial Resources, Production Engineering & Planning, Materials and Purchased Parts, Quality Assurance, Logistics, and Contract Administration. This request for exemption was approved by NAVSEA on 26 September 1988.

A second Acquisition Review Board was held on 27 September 1988 to specifically review the AOE-6 Program. The assessment of this review indicated that the status of the program was beginning to get off track - specifically; schedule delays were resulting from testing of the reduction gear, a Machinery Centralized Control System (MCCS) change, and administrative delays due to large volumes of unanswered correspondence. Personnel shortfalls continued to hamper SUPSHIP and the Program Manager, while production readiness was slowing due to inadequate design specification. Financially, change orders and requests for equitable adjustments (REA) were causing budget overruns and funding shortfalls. (See Appendix A for a financial profile of NASSCO during this time). Finally, no decision had been made on a homeport location or the funding for the associated facilities. However, the final recommendation by the ARB was that the Program proceed on to the Navy Program Decision Meeting (NPDM) for Milestone III approval and follow-on ship award.

An independent assessment of the AOE-6 program was conducted by the Naval Center for Cost Analysis on 1 November 1988 and provided as part of the information reviewed by the participants at the NPDM. The findings of that assessment stated:

- The Program Manager's estimates for the AOE-6 would be expected to increase as a result of problems arising from the contract specifications.
- Change orders for the AOE-6 were expected to increase over the 10% basic construction currently budgeted.
- The requirement for onboard repair parts would increase.
- If change order requirements increased significantly and if it became necessary to negotiate REAs with NASSCO, the costs for AOE's 7, 8, and 9 would increase.

Milestone III for the follow ship production of the AOE-6 Program was approved on 2 November 1988 by the Assistant Secretary of the Navy (Shipbuilding and Logistics).

On 3 November 1988, the Government exercised its option for the AOE-7 with NASSCO.

Option Ship Awards

On 10 November 1988, Morrison-Knudsen met with the ASN(S&L) to announce that they intended to sell NASSCO to its employees and that negotiations with the employees were currently underway. On 5 December, Morrison-Knudsen asked the Navy to approve one of two alternatives for the completion of the AOE-6 Program; (1) transfer of the AOE contract to the Avondale shipyard (located in New Orleans, La.), or (2) a \$20M liability cap on NASSCO to complete the work. The cap meant that Morrison-Knudsen would be liable for only \$20M in costs, if NASSCO was financially unable to cover losses on the contract. The Navy rejected the transfer proposal to Avondale as well as the \$20M

liability cap and proposed instead, a \$60M alternative cap, which the Navy believed would provide more incentive for Morrison-Knudsen to support NASSCO in completing the contract. On 2 February Avondale stopped negotiations with Morrison-Knudsen due to delays in resolving the transfer question.

The financial status of NASSCO and the decision by its parent company, Morrison-Knudsen to sell it represented another critical decision point in the AOE-6 Program - what would the Navy do - what would Morrison-Knudsen do? To date (1987 - 1988) the Program had: awarded a contract to NASSCO found that NASSCO was not using a previously accepted management system for schedule and cost control criteria already received a problem report on a critical, long-lead equipment from a sub contractor hired by NASSCO been advised by the ARB that the program was going off track been understaffed and unable to respond to critical correspondence submitted by the shipbuilder, and been advised that NASSCO was experiencing serious financial problems

In March of 1989 Morrison-Knudsen and NASSCO reached a resolution on the terms of an agreement to sell NASSCO to its employees. The new company - NASSCO Holdings Inc. - would receive \$8M in credit from Morrison-Knudsen which would also contribute \$45M in capital or cancel the intercompany debt of NASSCO. Additionally, Morrison-Knudsen would sell 80-100% of common stock to NASSCO Holdings Inc. for approximately \$4-5M and purchase \$8M of preferred stock from them. The Navy agreed to this plan.

On 12 December 1988, NASSCO submitted a Plan of Action and Milestones (POA&M) that stated they would not be able to make corrections to the C/SCSC and be

prepared for a Readiness Assessment Review (RAR) until June 1990. The Navy advised NASSCO that this was unacceptable and on 23 February 1989, NASSCO agreed to provide the C/SCSC systems description (except the material section) for review by 5 June 1989.

The keel for the AOE-6 was laid on 24 February 1989.

On 25 May 1989, the Navy issued a Decision Coordinating Paper which identified the cost of the AOE-6 and AOE-7 at \$497M and \$363.9M respectively (See Appendix B for a chronology of the funding profiles). The government conducted the Readiness Assessment Review (RAR) of NASSCO Holdings Inc. on 26 June 1989 and accepted the POA&M on 18 July.

The next annual review by the Acquisition Review Board took place on 10 October 1989 and provided a very cautious overall assessment of the program. Specifically; the schedule was still experiencing delays as previously identified and the contractor production performance would probably result in both a launch delay as well as a delivery delay. At the same time the contractor was experiencing material availability and outfitting problems and the homeporting problem had still not been resolved. The financial risks were still present, with change orders and budget overruns now being funded from the Ship Construction Account (SCA), and the ability of NASSCO Holdings Inc. to absorb a loss was still in doubt.

In November 1989, Cincinnati Gear - the manufacturers of the AOE-6 reduction gear - announced that the RRG would be 16 months late. This was officially announced by NAVSEA in February 1990 and resulted in a revised ship delivery date from July 1991 to November 1991.

On 6 December 1989 the Government exercised its option for the AOE-8 and awarded the contract to NASSCO.

In February 1990, NAVSEA called in a private contractor - Advanced Marine Engineering - to review the NASSCO production schedule. The results, as shown below were not promising. The review concluded that:

- The AOE-6 was in severe trouble, especially in the areas of production manhour efficiency and projected manhours at completion.
- Construction was now at the 46% stage but, production manhour efficiency was only at 69%.
- The latest cost estimate of \$3.4M provided by NASSCO for production manhours would not be met. Advanced Marine Engineering estimated a more accurate figure would be \$5.2M.
- The total (production and engineering) labor manhour estimate at the completion of the job by Advanced Marine Engineering was estimated at \$6.9M vice NASSCO's estimate of \$4.8M.

Additionally, during this same time, a serious dispute was developing between the Navy and NASSCO over the cost/schedule control system criteria (C/SCSC) discrepancies which were uncovered in the revised system description NASSCO provided after the Readiness Assessment Review held in June 1989. Specifically, NASSCO refused to make changes to the C/SCSC without direction from the contracting officer, while SUPSHIP at San Diego recommended that NAVSEA refuse to recognize NASSCO's C/SCSC as satisfying the financial requirements stipulated in DOD Instruction 7000.2 - without which NASSCO could not proceed on to the next milestone in the production process. It was decided that another C/SCSC review would be conducted at NASSCO in 120 days.

While the Advanced Marine Engineering report was being reviewed by the Navy, NASSCO had to report that Cincinnati Gear was financially insolvent and required immediate assistance (See Appendix C for a financial analysis). In May 1990, the government revised its estimate for the delivery of the reversing reduction gear to April 1991 (25 months late) and at the same time revised the estimated ship delivery date to May 1992.

Over the course of the summer of 1990, NASSCO conducted meetings with the Navy and Cincinnati Gear to explore the possibility of converting the reversing reduction gear to Government Furnished Equipment (GFE) under a separate contract. NASSCO contended that reduction gears for other ship programs had been GFE due to the high tolerances and rigorous standards required in their manufacture and that this process was further exacerbated because the reversing reduction gear for the AOE-6 was a prototype! As such NASSCO should not be held liable for cost overruns due to delays in manufacturing and delivering for such a unique piece of equipment.

Due to its cost, manufacturing time and criticality in the ship construction process, the resolution of the reduction gear issue represented another critical decision point in the AOE-6 Program. What was the Navy going to do? With regard to the reduction gear the Program manager knew: •it was the first of its kind on a Navy ship •the manufacturer had experienced problems almost from the start in production •the Navy had previously provided reduction gears as GFE, and •that NASSCO was already in serious financial trouble.

The Navy did accept the argument made by NASSCO and a separate contract was signed with Cincinnati Gear in August 1990 with a delivery date set for 15 April 1991. In

November 1990 Cincinnati gear notified NAVSEA that the reduction gear delivery date had slipped to 15 May 1991.

A second - more indepth review and analysis of NASSCO's production capability was conducted by Advanced Marine Engineering during May 1990. This review detailed an even bleaker picture of the shipbuilder.

- With the construction progress at the 59% stage, production manhour efficiency had decreased to 66%.

- Advanced Marine was still projecting a production manhour cost at completion of the project of \$5.2M and the total (production and engineering) labor manhour cost was now estimated at \$7.0M vice NASSCO's projected \$5.3M.

- The initial analysis of AOE-7 conducted during this review indicated that this program had more severe problems than the AOE-6 program. Specifically, (1) production manhour efficiency was worse than that on the AOE-6 at the same point in construction, (2) the production manhour cost estimate at completion of the project by Advanced Marine was \$4.8M vice NASSCO's estimate of \$2.7M, and (3) Advanced Marine projected that it would take more actual hours of work on the AOE-7 than on the AOE-6 to accomplish the same percentage of progress.

The previously scheduled C/SCSC review was conducted by NAVSEA during July - August 1990 and discrepancies forwarded to NASSCO for correction. NASSCO requested and received permission to submit their POA&M for these discrepancies in 60 days vice the normal 30. This POA&M was received by the Navy in November with a request by NAVSEA to conduct an interim review in January or February 1991.

In December 1990, Advanced Marine Engineering conducted another analysis of the AOE construction program at NASSCO. The results of this review concluded that the AOE-6 trends previously described continued and that now production manhour efficiency had decreased to 63%, while the AOE-7 data continued to show worse trends than the AOE-6 with a major concern being expressed that the AOE-7 production manhour completion costs could become higher than the AOE-6.

In January 1991, Cincinnati Gear notified NAVSEA that the reversing reduction gear delivery date had slipped further to 7 June 1991.

As production continued on the AOE program throughout 1991, the contractor continued to experience problems in production, scheduling, labor and financing. (See Appendix D for a financial analysis of NASSCO during this time). Heading the list of financial problems facing NASSCO was approximately \$460M in outstanding claims which NASSCO argued the Government owed them for work completed and cost overruns and production delays caused by hold-ups in receiving GFE. Failure by NASSCO to receive some relief would cause them to file for Chapter 11.

This was another crucial decision point in the AOE - 6 Program. How was the Navy going to ensure continuation of the program after nearly a decade of work and millions of dollars in sunk costs? The Program Manager knew: •NASSCO had already been awarded three ships which were in various stages of construction •NASSCO was on the brink of financial ruin, and •GFE delays were causing delays in production which were in turn leading to cost overruns on the contracts

The solution to this problem was to cancel the AOE-9 and use the funds programmed for this ship to completely re-baseline a new contract with NASSCO. The cancellation of AOE-9 enabled the Navy to grant approximately \$239M in claims settlements to NASSCO which allowed them to remain financially solvent. The new contract was awarded to NASSCO in the December 1991 - January 1992 time frame.

While eliminating the AOE - 9, improved the future viability of NASSCO, it left the Navy with a shortfall of one AOE Class ship to meet its original requirement of four new station ships. This shortfall led to a new contract design and RFP for the AOE - 10. The contract was based on the previous AOE - 6 design and was to be competitively bid. NASSCO had a strong competitive advantage over the other bidders due to its involvement with the AOE - 6 Program. This substantially reduced their learning curve and provided them with an already existing production line for similar ships of the this class. The AOE-10 was awarded to NASSCO in the Fall of 1992

CONCLUSION

At the writing of this paper, the AOE-6 has still not been completed (almost 2 years late) with a projected delivery date of October 1993, and the current end cost is now estimated to be \$665M (\$216M above the amount appropriated by Congress and \$375M higher than NASSCO's original bid). The remaining ships are scheduled as follows:

- AOE-7 delivery date of July 1994, estimated cost \$453M
- AOE-8 delivery date of April 1995, estimated cost \$465M
- AOE-10 delivery date not known , estimated cost \$498M

It is not the intention of this paper to assess blame or make assertions of any wrong doings on the part of the individuals, agencies, or companies involved in the AOE Program. The information presented here is meant to be a guide into the complex process of major acquisition programs and to show that no matter how well intentioned the participants may be and how carefully they follow the stringent requirements for government procurement - things can and do go wrong. This invariably leads to program cost overruns, legal disputes, lost jobs and inefficient use of scarce public funds.

APPENDIX A

NATIONAL STEEL AND SHIPBUILDING COMPANY (NASSCO)

FINANCIAL ANALYSIS

THROUGH 1990

NCA/Blackburn

5 Jun 1991

Overview.

- Morrison Knudsen Inc. (MKI) wrote-off \$42M when they divested NASSCO in April 1989.

- The divestiture followed two consecutive years of losses at NASSCO totalling \$45M.

- NASSCO's financial woes have continued as a result of losses accruing from AOE contracts.

-- Without the financial backing of MKI, NASSCO is facing bankruptcy.

-- In 1990, NASSCO's operations produced a negative cash flow of \$11M leaving just \$12M of non-obligated cash available to fund operations.

Contractual Relief.

- In Feb. 1991, The Secretary of the Navy in the interest of national security granted NASSCO \$24M in contractual relief.

-- Has received \$11M to date.

-- The relief is intended to keep NASSCO's cash investment (loss) on the AOE-6, 7, and 8 at \$41M until claims against the Navy are resolved in Sept. 1991.

-- In the event of bankruptcy, NASSCO has agreed to continue work and launch the AOE-7.

- As a result of NASSCO's precarious financial position, the Navy stopped work on the AOE-8 for two months.

Primary Business: Combat support ship construction.

- Major Programs:
 - o AOE-6
 - o AOE-7
 - o AOE-8

Secondary Business: Commercial container ship construction and general repair.

- Programs:
 - o Matson Line container ship

1990 Sales:	\$400M
Govt.	75%
Commercial	25%

Employees: 3796

AOE-8

Work stopped:	15 March 1991
Work resumed:	17 May 1991

Conditions for work to resume:

- Work will not impede launching the AOE-7 in September 1991.

- NASSCO's cash investment on AOE construction will not exceed \$41M.

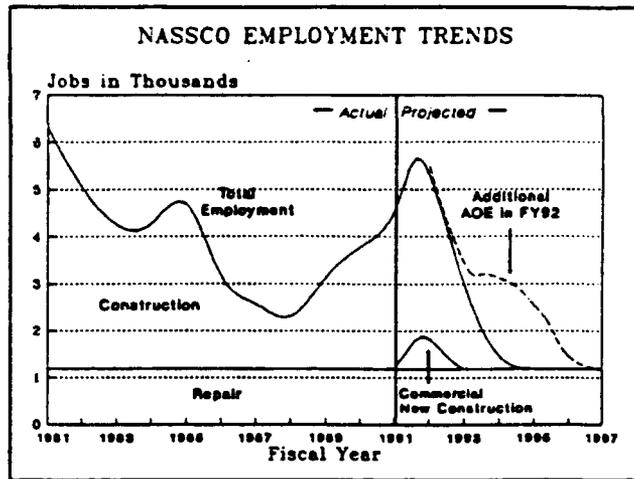
- Work on the AOE-8 will be limited to modules and subassemblies which, if necessary, can be shipped to another yard for completion.

Business Sensitive

Financial Analysis of NASSCO

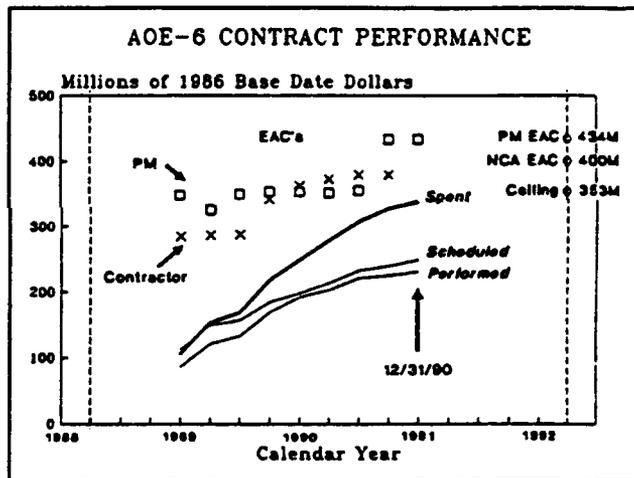
Business Base.

- AOE construction will represent 75% of NASSCO's revenues in 1991.
- An AOE-9 option was not exercised due to a lack of financial responsibility on the part of NASSCO.
- An AOE-10 offers some hope.
 - If funded by Congress, the ship will be competitively awarded.
 - NASSCO's financial health could disqualify the yard.



Contract Performance.

- With work on the AOE-6 85% complete, costs are expected to exceed ceiling by roughly 15% to 25% (\$50M to \$100M in FY91 dollars).
- Additional losses of almost \$200M are expected on the AOE-7 and 8.
 - AOE-7 is 60% complete.
 - AOE-8 is 20% complete.



Claims.

- NASSCO has submitted \$450M (\$FY91) in claims on the AOE-6, 7, 8, and 9.
- They have been granted \$95M as provisional settlement of two claims.
 - To date NASSCO has received \$55M.
- Final settlement of claims is expected in September 1991.

For NASSCO to Break-Even: (In millions of FY91 dollars)	
Est. loss on AOE-6, 7, and 8	\$287M
Relief \ Claims received	\$106M
Loss \ Claim settlement needed to break even	\$181M
Total claims submitted	\$450M

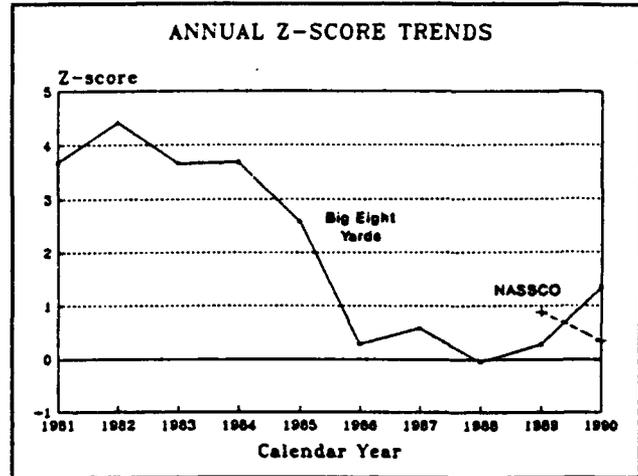
Financial Analysis of NASSCO

Solvency.

- Without a favorable settlement of claims or additional relief, NASSCO's financial status will deteriorate.

- NASSCO's cash flow from operations in 1990 would have been \$-40M if they had not deferred \$30M in liabilities.

-- Without a positive cash flow in the near future, NASSCO will be forced into bankruptcy.

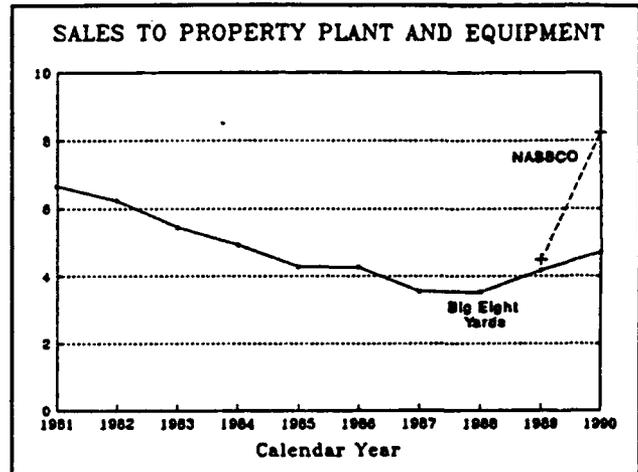


Operational Effectiveness.

- NASSCO's fixed assets appear to be working close to capacity.

- Capital investment will be required if NASSCO is to gain additional work in order to remedy their current woes.

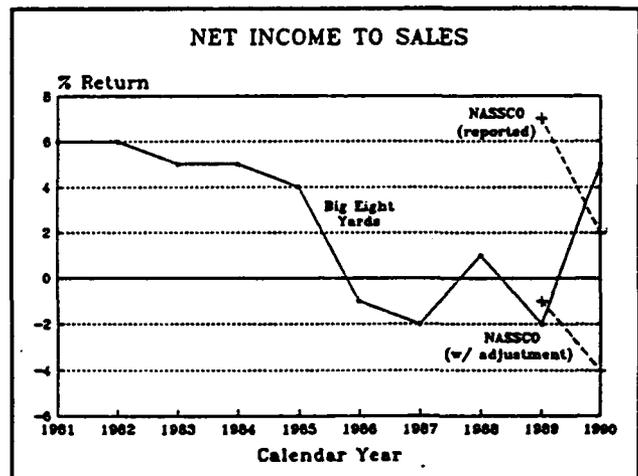
-- Given the limited number of commercial vessels produced in the U.S. and NASSCO's financial health, this seems unlikely.



Profitability.

- NASSCO has recorded \$60M of unbillable costs as revenue.

-- If they are not allowed to bill this amount pending the resolution of claims, it will have to be written off.



Financial Analysis of NASSCO

Conclusion.

- NASSCO's near term survival can be insured by either extraordinary relief or a favorable settlement of claims.
 - The firm's long term viability as a new construction facility is questionable. In the absence of any new business, NASSCO will be forced to rely solely on repair work to stay afloat.
-

APPENDIX B

AOE 6 FUNDING HISTORY

	FY87	FY88	FY89	FY90	FY91	TOTAL
1/85 FYDP	1/756.6	1/572.5	1/593.7	1/608.3	-	4/2531.1
1/86 FYDP	1/612.7	-	1/520.0	1/545.8	1/542.6	4/2221.1
1/87 FYDP	1/499.0	-	1/425.4	-	2/903.2	4/1827.6
2/88 FYDP	1/497.0	-	1/363.9	-	2/903.2	4/1764.1
2/89 FYDP	1/497.0	-	1/363.1	1/356.4	1/357.7	4/1574.2
1/90 FYDP	1/546.8	-	1/361.9	1/379.8	1/398.2	4/1686.7
1/91 FYDP	1/573.8	-	1/389.4	1/389.4	-	3/1352.6

SOURCE: SEA 93 REPORT DATED 15 FEB 1991

APPENDIX C

CINCINNATI GEAR (CGCo)

FINANCIAL ANALYSIS

Through 1st Qtr 1992

Blackburn

30 Jul 92

Overview

- CGCo is a small privately held business founded in 1907.

-- In 1987, Mr. Walter Rye acquired the firm in a LBO.

- Cost overruns on the AOE Reversing Reduction Gears (RRG) contract and high debt levels have placed CGCo in a precarious financial position.

-- As a result, CGCo has requested \$9.1M in relief (85-804) in order to complete work on the AOE RRGs contract.

Business Base.

- Through the 1980's, CGCo relied primarily on gearing work for the following surface ship programs:

- LCAC
- TAO
- AOE

- Further, CGCo's surface ship work has been supplemented by:

- MK-17 & 19 Torpedo Ejection System Gearboxes for Trident & foreign attack subs
- V-22 Gears

- As new ship programs have become scarce, CGCo has begun to look more extensively at commercial ventures.

-- Early this year, CGCo secured a long-term contract with the Detroit Diesel Corporation for the production of gear systems for GM trucks.

-- This contract should provide roughly \$10M in annual revenues over the next 5 years.

Primary Business: Design, development, and production of gearing systems for Naval ships

Major Programs:

- o AOE
- o LCAC

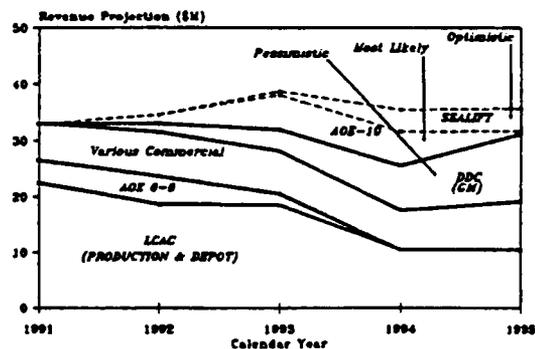
Government Sales: 75%
Commercial Sales: 25%

of Employees: 250
Total Assets: \$ 31M
1991 Sales: \$ 37M

EXISTING DEFENSE WORK AT CGCo

PROGRAM	CUSTOMER	TYPE WORK	CONTRACT VALUE	SCHEDULED COMPLETION
AOE	NAVY	RRG PROD	\$32M	7/93
AOE	NAVY	SPARE PARTS	\$ 5M	7/93
MK-19	INGERSALL	MK-19 GEARS	\$ 1M	12/92
LCAC	TEXTRON	GEARING SYS	\$20M	3/96
LCAC	TEXTRON/ AVONDALE	SPARES	\$ 4M	12/92

BUSINESS BASE



Financial Profile of Cincinnati Gear

Solvency.

- CGCo's poor Z-score results from a lack of liquidity and liberal use of debt.

- Operating cash flows have been insufficient in covering losses and meeting debt payments.

-- Thus, cash balances have been drawn down from roughly \$700K in 1987 to \$12K currently.

-- Further, debt has risen from roughly 80% of assets in 1987 to 90% currently.

- Without relief, CGCo could be facing bankruptcy as soon as mid-to-late 1992.

- Due to the manner in which progress payments are made, AOE-10 and Sealift would not provide a significant infusion of cash until 1995 and 1997 respectively.

- Roughly \$1.4M of the cash shortfall projected in 1993 is for relocating the firm's New Jersey factory to Kentucky for "better management control."

Profitability.

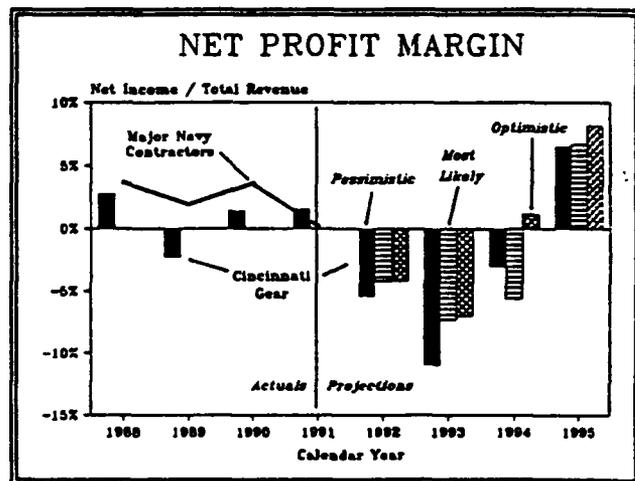
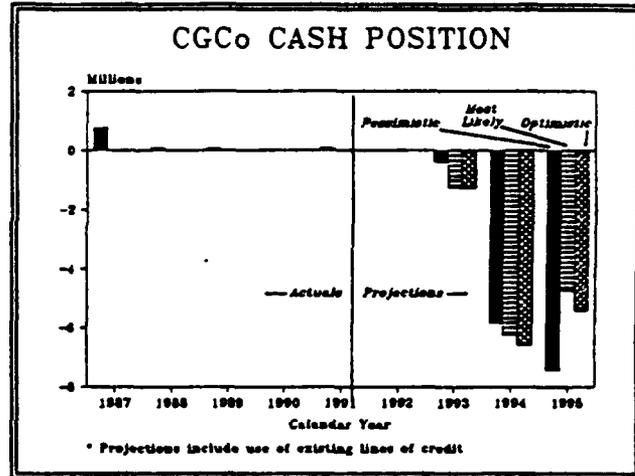
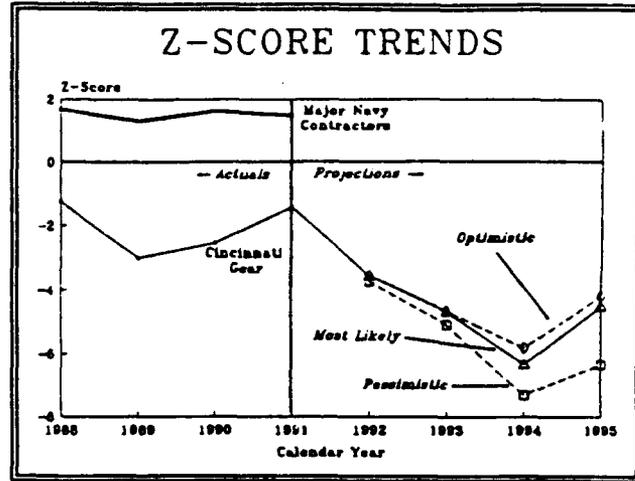
- Although somewhat profitable in the past, it is unlikely CGCo will continue to be so in the future due to:

-- Mounting losses on AOE-6, 7, and 8 RRGs which could exceed \$5M by completion

-- Large interest payments amounting to roughly 5% of annual revenues

-- \$1.4M in proposed relocation expenses in 1993.

- Commercial work, although historically not profitable, offers some hope.



Financial Profile of Cincinnati Gear

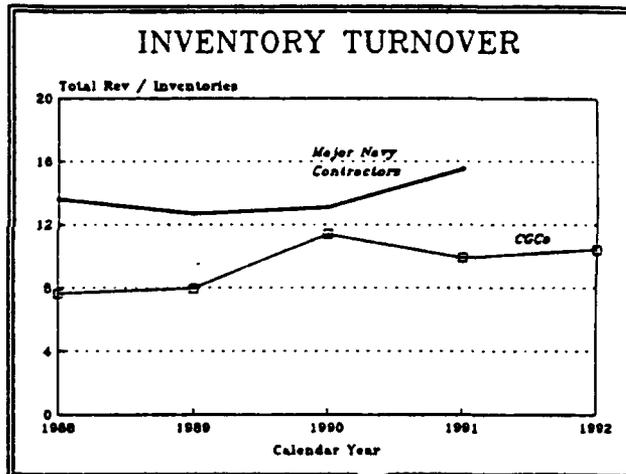
Profitability cont.

- CGCo's overruns on the AOE contract result from:
 - Complexity of work; first RRGs to be installed in a U.S. Navy ship
 - Stringent delivery schedule
 - Firm fixed price for development and production
- Target man hours for the AOE-10 option were revised June 1992.
 - Should allow for a normal level of profit.

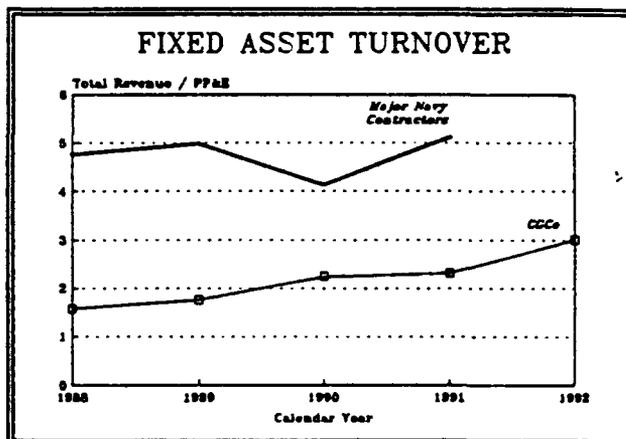
	PROGRAM		
	TAD	DDG-51	AOE-6
CONTRACTOR	CGCo	GE	CGCo
CUSTOMER	Navy	Navy	NASSCO
DEVELOPMENT (MTHS)	24	48	48
REVERSING GEARS	No	No	Yes
NOISE RMT	NA	92db	84db
DELIVERY (MTHS) SCHEDULE	NA	46	24
ACTUAL	NA	60	57

Operating Performance.

- CGCo's highly leveraged position has led to gains in efficiency.
 - These gains, however, have been marginal and are not expected to be sufficient in offsetting AOE 6-8 losses or meeting debt payments.



- Although CGCo's operations are capital intensive (only 250 employees), their fixed asset turnover is still considered low but improving.



- Further improvements in revenue generation presents opportunities for reduced capital expenditure requirements.

Financial Profile of Cincinnati Gear

Prognosis.

- CGCo's future appears bleak at best without relief, renegotiation of debt schedules, or the profitable sale of assets.

-- Demand for CGCo's assets appears low given the current decline of the shipbuilding and automotive industries.

- Sealift and AOE-10 would result in an immediate cash drain; however, over the mid-to-long term, these programs could ensure CGCo's survival.

-- At the Navy's request, CGCo has extended the option for AOE-10 RRGs until 31 August 1992.

-- Competition for Sealift is expected to be fierce; therefore, the potential for little or no profit is high. Other likely competitors are GE, Westinghouse, Philadelphia Gear, Luftkin, and several foreign firms.

Impacts of Bankruptcy.

- In the event CGCo declares bankruptcy and is unable to finish work on the AOE-7 & 8 RRGs, the estimated effects on the AOE program are as follows:

o SCHEDULE

<u>Program</u>	<u>Current Est</u>	<u>Est if Gears Finished at Another Contractor</u>	<u>Delta</u>	<u>Source</u>
AOE-7 RRGs	2/93	2/95	24 mths	NAVSEA
AOE-8 RRGs	7/93	1/96	30 mths	NAVSEA
AOE-7 Ship	1/94	1/96	24 mths	NAVSEA
AOE-8 Ship	8/94	2/97	30 mths	NAVSEA

o COST

<u>Program</u>	<u>Estimated Cost to Complete</u>	<u>Est if Gears Finished at Another Contractor</u>	<u>Delta</u>	<u>Source</u>
AOE-7 RRGs	\$ 5M	\$ 8M	\$ 3M	NAVSEA
AOE-8 RRGs	\$ 6M	\$10M	\$ 4M	NAVSEA
AOE-7 Ship	\$40M	\$60M	\$20M	AOE-6 Claim
AOE-8 Ship	\$55M	\$75M	\$20M	Settlement **

** Represents rough order of magnitude estimates

- In the event the AOE-10 RRGs is awarded to a contractor other

~~Business Sensitive~~

Financial Profile of Cincinnati Gear

than CGCo, costs would be expected to increase from \$17M (current option price from CGCo) to at least \$22M.

-- Based on current estimates for AOE-7 RRGs.

- Further, CGCo is currently under contract with Textron Marine for the production of gears for LCACs and is also the designated depot facility.

-- LCACs produced at Avondale also use gearing systems built by CGCo.

Business Sensitive

APPENDIX D

NATIONAL STEEL AND SHIPBUILDING COMPANY (NASSCO)

FINANCIAL PROFILE

Through 1991

Hardin

24 Aug 92

Overview

- NASSCO's short-term financial health has improved since granted \$239M in claims settlements from the Navy relating to the AOE-6 contract plus options.

- Total claims submitted amount to \$460M.

- In Feb 91, the Navy granted NASSCO \$25M (part of \$239M) in relief to keep them from filing Chapter 11.

- Cincinnati Gear, NASSCO's former subcontractor, is also requesting financial relief. They are now under DON direct contract to deliver AOE-7 and -8 Reversing Reduction Gears (RRGs), due in Feb93 and Jul93.

- RRG dates could slip further.

Business Base

- NASSCO's AOE-6, -7, and -8 are scheduled for delivery in Apr93, Jan94 and Aug94.

- AOE-9 was cancelled.

- AOE-10, if funded, will be competitively awarded, possibly in fall of 92.

- NASSCO is building a Matson Line container ship; one of only three commercial ships being built by a U.S. shipyard.

- Small profit is expected.

- NASSCO is not now bidding on any new commercial work.

- NASSCO will be one of nine yards competing for Sealift ships.

Primary Business: Combat support ship construction

Government Sales: 85%
Commercial Sales: 15%

of Employees: 3,674

1991 Sales : \$357 M
1991 Assets: \$206 M

Moody's Senior Debt Rating: N/A
S & P Common Stock Rating : N/A

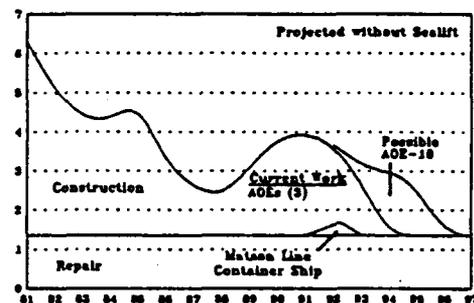
AOE-6 Support Ship Contract Status
(In millions of contract dollars)

	Approved Price*	PM's EAC	Overrun**
AOE-6	414	486	72
AOE-7	280	309	29
AOE-8	265	300	35
Total	959	1095	136

* Includes original negotiated cost plus approved claims settlements of \$239M as of Dec 91.

** Represents amount of additional claims needed for NASSCO to break even on AOE-6 contracts.

EMPLOYMENT IN THOUSANDS

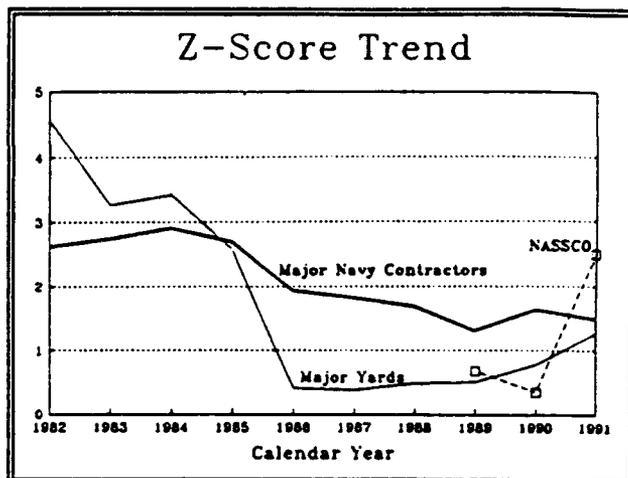


Source: SEA-07, NASSCO

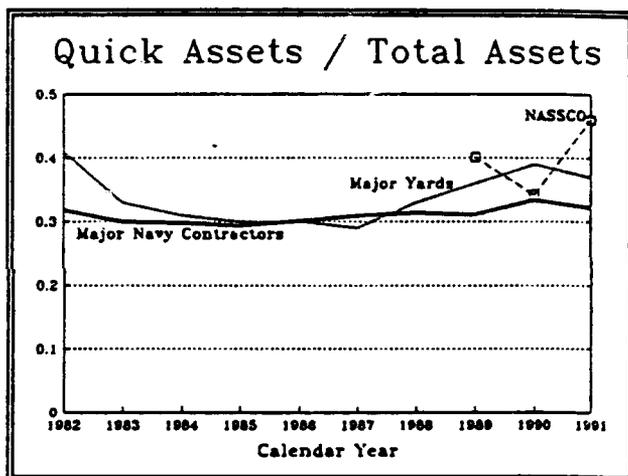
Financial Profile of NASSCO

Solvency

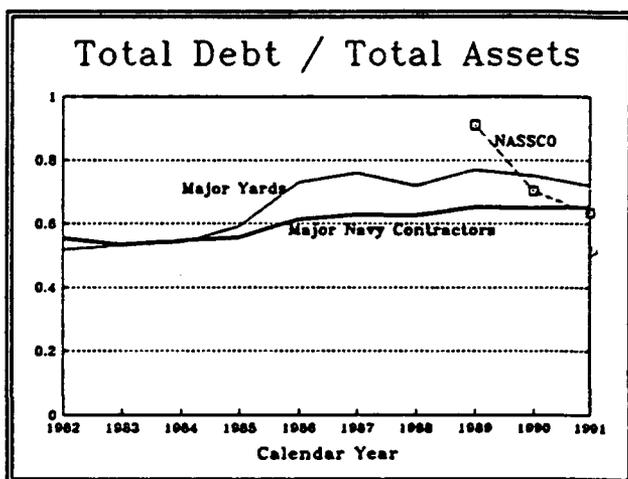
- NASSCO's solvency improved during 1991 resulting in a Z-score of 2.49.
- Receivables increased 30% during 1991; mostly related to commercial billings.



- NASSCO's liquid assets increased significantly in 1991 due to increases in cash and receivables.
 - The increase in cash was principally due to claims settlements mentioned earlier.
- Cash flow from operations was \$16M in 1991.



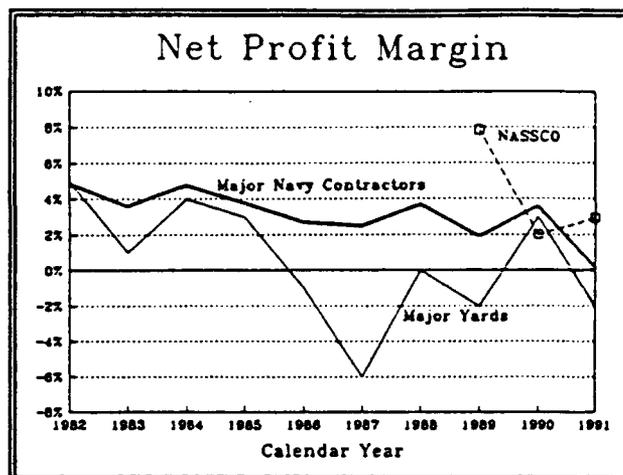
- NASSCO's debt-to-assets ratio has continued to improve.
- NASSCO is carrying only \$21M in long-term debt.
 - This debt, an industrial development bond with a 6-1/4% coupon, is due in 2002.
- NASSCO's only credit line is \$21M at Bank of America.



Financial Profile of NASSCO

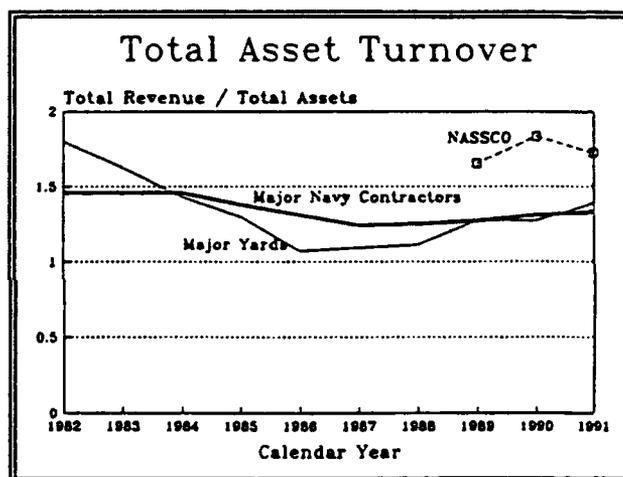
Profitability

- NASSCO's recent settlement with the Navy seems to have stabilized their profit margins.
- Future profits will hinge on NASSCO containing any further cost growth on AOE ships.
 - Continued delays at Cincinnati Gear on RRGs could lead to more claims by NASSCO.
 - NASSCO is currently showing no profit on the AOE's.



Operating Performance

- Despite their seemingly high asset turnover ratio, NASSCO currently has unused capacity in their repair facilities.
 - Vacated space due to completion of Exxon Valdez allows for repair work on other ships.
- NASSCO needs AOE-10 to retain its skilled work force.



Prognosis

- NASSCO can remain a healthy shipyard in the short-term by avoiding any more serious cash problems and improving performance on AOE-7 and AOE-8.
- Department of the Navy needs to press Cincinnati Gear for prompt delivery of RRGs to avoid future cost growth on AOE's and NASSCO claims that are sure to follow.
- NASSCO has a significant competitive advantage in bidding for AOE-10.
- NASSCO will be a strong contender for Sealift because of AOE and Matson experience.
- If NASSCO does not win Sealift or any new commercial work, they will shrink significantly and will exist only as a repair yard by mid-to-late 90s.

REFERENCES

Chronology:

The specific events and dates detailed in this case study are attributable to the AOE-6 Program Management Office, Naval Sea Systems Command, (PMS-383), Alexandria, Va.

Financial Profiles:

The financial profiles found in the Appendices were developed by the Naval Center for Cost Analysis (NCA), Alexandria, Va.