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The Honorable Jay Byrnes, Chairman, Committee on Armed Services
United States Senate

RELEASED

The Honorable Joseph P. Addabbo
Chairman, Subcommittee on Defense
Committee on Appropriations
House of Representatives

Subject: Request to Fully Fund Two Nuclear Aircraft Carriers
in Fiscal Year 1983 (MASAD-82-27)

Your letters of February 5, and February 9, 1982, requested that we review the Navy's proposal for fully funding two nuclear aircraft carriers in fiscal year 1983 to determine if their projected improved delivery schedule and cost avoidance estimate are achievable. We found the improved delivery of 22 months is reasonable under the assumptions made by the Navy and can be achieved if certain events happen as planned. The Navy's estimate of the cost avoidance of \$754 million, or 10 percent of the estimated cost, is reasonable based on our analysis of their cost estimating assumptions and techniques. However, when the interest costs associated with the funding differences are considered and these differences are expressed in terms of their present value, the claimed cost avoidance is reduced or even negated. This consideration does not account, in dollar terms, for the value of the early delivery made possible by the multiship approach.

In conducting this review, we obtained and analyzed data related to the delivery and cost estimates and interviewed personnel in the Office of the Secretary of Defense; the Navy; Office of Management and Budget; Congressional Budget Office; and the contractor, Newport News Shipbuilding Company. We also used some economic analysis techniques to attempt to determine the economic effects of the funding alternatives. We analyzed this information to determine if the Navy's schedule and cost avoidance projections are achievable. Because of the time constraints, we were not able to verify the accuracy of the improved schedule and cost avoidance in detail; however, we did review the reasonableness of the underlying assumptions on which these projections are based.

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We did not examine the military need for the two carriers nor did we address such issues as the proper force level structure, small versus large carriers, procuring adequate carrier aircraft, and other battle group ships to meet the improved carrier delivery schedule nor did we look at the availability of necessary trained personnel.

BACKGROUND

The Navy is seeking \$6.8 billion in its fiscal year 1983 budget proposal to fully fund two nuclear aircraft carriers, the CVN-72 and CVN-73. According to the Navy, the carriers are required to replace two of the older carriers--the Coral Sea and the Midway--which are scheduled to be decommissioned after nearly 45 years of service. Thus the two proposed carriers, along with the CVN-71, which was funded in fiscal year 1980 and is currently under construction, will maintain the number of carriers at 15.

According to the Navy, fully funding both carriers in fiscal year 1983 will result in a delivery date for each which will be about 2 years earlier than would be possible if they used the single ship annual approach. Also, the Navy believes it can achieve cost avoidance of \$754 million, about a 10-percent savings. Navy officials said that the improved delivery schedule is the critical factor. The savings in both time and money are based on comparing the full funding of two carriers in fiscal year 1983 versus full funding one in fiscal year 1984 and one in fiscal year 1986.

IMPROVED DELIVERY SCHEDULE

The Navy is projecting that by fully funding the two carriers in fiscal year 1983, rather than funding the two as single ship annual procurements, each carrier delivery can be improved approximately 22 months. The 22 months improved delivery is due to a saving of:

- About 10 months due to the earlier start of work afforded by full funding in fiscal year 1983 instead of a year later.
- About 12 months actual construction time compression due to the economies accruing from series construction. These series construction economies result from such things as a stable workforce which can move from carrier to carrier without the gaps that normally occur and the production efficiencies regarding material and work flow that could be accomplished with multiship construction of carriers. Also, phasing the two new carriers in with the CVN-71 to achieve optimum labor and work flow could have an additional shortening affect beyond the projected 22 months.

The Navy believes that the contractor is in a position to build carriers faster than it has in the past. In the 1970s, the contractor added modern, potentially more productive facilities to its yard. These facilities were to be used to produce large, commercial ships. However, the commercial shipbuilding market is currently depressed, thus freeing these facilities for use in constructing carriers. The CVN-71, which is about 10- to 15-percent complete, is the first carrier being constructed using these facilities. The Navy and the contractor believe these modern facilities will permit productivity gains enabling an early delivery of the CVN-71. The Navy has not considered these improvements, however, in the delivery of the CVN-72 and CVN-73 because (1) the results have not been proven to date and (2) other variables, such as how the contractor will phase its work between the new and old facilities, would affect how the expected productivity gains will accrue to the series ships.

In December 1981, the Navy executed a modification to the CVN-71 contract that offers an incentive to the contractor to deliver the carrier approximately 14 months earlier than the current contract delivery date of February 1988. The projected delivery dates of the CVN-72 and CVN-73 are predicated on the CVN-71 delivering earlier than February 1988. The projected CVN-72 and CVN-73 improved delivery is also based on the following events

- providing sufficient fiscal year 1982 Research, Development, Test and Evaluation funds to the contractor during the spring of 1982 for planning purposes;
- awarding a long-lead contract in October 1982; and
- having fiscal year 1983 funds appropriated in time to award the basic ship construction contract by January 1983.

If these dates are not met, the delivery dates of the CVN-72 and CVN-73 could slip, but we were unable to find out the extent of the possible slippage. Neither the Navy nor the contractor could provide us with data linking these milestones with possible resulting slippages.

According to the Navy, the CVN-72 and CVN-73 are the same configuration as the CVN-71--the design is stabilized.

Looking at the three ships together as a series construction, the multiship procurement of the CVN-72 and CVN-73 will facilitate the earlier delivery of the CVN-71. If the contractor does not get the CVN-72 and CVN-73, some of the motivation to deliver the CVN-71 early could be lost. If delivery schedules are to be improved, we believe that the contractor must quickly begin and effectively implement the planning necessary to phase in the CVN-72 and CVN-73 with the CVN-71. This would also enhance the potential achievement of optimum labor, material and work flow, and optimum facilities use.

COST AVOIDANCE

The Navy's multiship cost estimate is based on the projected improved delivery and economies to be gained from series construction of the CVN-72 and CVN-73. The Navy projects that \$754 million can be avoided by fully funding the two carriers in fiscal year 1983. The projected cost avoidance is attributable to reduced escalation, economic order quantities of ship sets, reductions in nonrecurring costs, and improved productivity and labor use.

Table 1 shows the funding profiles for the multiship proposal and the single ship annual approach. The cost avoidance projection of \$754 million is obtained by comparing these two approaches.

Table 1CVN-72 and CVN-73 Alternative Funding Profiles

	<u>FY 1982</u>	<u>FY 1983</u>	<u>FY 1984</u>	<u>FY 1985</u>	<u>FY 1986</u>	<u>Total</u>
	------(millions)-----					
Single ship annual approach	\$475	\$ 583	\$3,056	\$945	\$2,965	\$8,024
Multiship proposal	<u>475</u>	<u>6,795</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>7,270</u>
Cost avoid- ance	<u>-</u>	<u>\$(6,212)</u>	<u>\$3,056</u>	<u>\$945</u>	<u>\$2,965</u>	<u>\$ 754</u>

Assuming the single ship annual approach, the two carriers would be funded as follows:

- Fiscal year 1982 - First increment of nuclear long lead for CVN-72.
- Fiscal year 1983 - Second increment of nuclear long lead for CVN-72. Nonnuclear long lead for CVN-72..
- Fiscal year 1984 - Remainder of funding for CVN-72. First increment of nuclear long lead for CVN-73.
- Fiscal year 1985 - Second increment of nuclear long lead for CVN-73. Nonnuclear long lead for CVN-73.
- Fiscal year 1986 - Remainder of funding for CVN-73.

The multiship proposal contains partial long-lead funding for nuclear components for the CVN-72 in fiscal year 1982 and full funding in fiscal year 1983 for the CVN-72 and CVN-73.

The Navy's projected \$754 million cost avoidance results from:

- Reduced escalation resulting from early procurement and improved delivery. The escalation portion of both estimates is based on the January 1982 Office of the Secretary of Defense's inflation indexes and escalation clauses in the shipbuilding contracts. The Navy estimates that of the \$754 million projected savings, approximately \$304 million, or 41 percent, is due to the reduced escalation costs resulting from improved delivery.
- Economic order quantities of ship sets. Approximately \$250 million, or 33 percent, of the \$754 million cost avoidance results from savings due to economic order quantities of ship sets buys of both the Government and the contractor furnished equipment. This represents about a 10-percent reduction in the cost of the Government and the contractor furnished equipment over the single ship annual approach. According to the Navy, there is some risk that there may be difficulties in obtaining some of their Government furnished equipment to meet the projected construction schedule. However, both the Navy and the contractor believe this will not cause disruptions to the improved carrier delivery schedule. They feel subcontractors involved will make an extra effort to meet delivery schedules if more than one ship set is ordered.
- Reductions in nonrecurring costs. Approximately \$100 million, or 13 percent, of the cost avoidance is the result of savings in nonrecurring and startup costs. This is from being able to plan for, procure, and make multiple use of jigs and molds, and so forth, for two ships instead of one. According to the contractor, the reduction in paperwork alone in the procurement of equipment and material will result in a significant cost avoidance.
- Improved productivity and labor use. Approximately another \$100 million, or 13 percent, of the avoidance results from the improved productivity and labor use resulting from the series construction. Ship construction is a highly labor intensive industry and thus, labor hour savings can have a significant affect on cost. The Navy's estimate for labor hours was based on those contracted for on the CVN-71. An adjustment was made for series production using the labor-hour reduction experienced on the CVN-68 and CVN-69. This resulted in approximately a 3-percent labor production improvement which was used in projecting the CVN-72 and CVN-73 labor hours.

The contractor observed that the Navy's potential cost avoidance of \$754 million is low. According to contractor

personnel, the cost avoidance could be 30 to 40 percent low. We did not examine the support for their estimate.

Analysis of cost avoidance

The Navy is projecting a cost avoidance of \$754 million, or 10 percent, if funds for the multiship approach are authorized and appropriated rather than the single ship annual approach. The funds authorized and appropriated for the two approaches would, however, be spent over a different number of years and the amount spent in each fiscal year would be different. The enclosure shows the Navy's projections of the outlay streams for the two funding approaches.

Because the outlay streams differ both in terms of annual outlays and in terms of duration, we considered the interest costs associated with the funding (which in turn would influence the deficit) and expressed the outlay streams in terms of their discounted present value. Taking these factors into consideration, the results depend on many variables, including the interest rate(s) assumed and the outlays per year projected for each alternative. Varying any of these factors can change the results.

The present value of the two funding approaches using a discount rate of 10 percent as prescribed by the Department of Defense (DOD) shows that the multiship alternative is about 2 percent less costly. Using a 13.97-percent discount rate based on the 12-year Treasury bond yield, the approximate period of outlays, our analysis shows that the single ship annual approach is less than 1 percent less costly.

Results affecting the budget deficit are obtained by including the compounded interest effect on the two projected outlay streams. The Office of Management and Budget used variable interest rates obtained from the 90-day Treasury rates presented in the budget projected to 1994 when compounding the outlays. These calculations showed that the multiship approach has a slightly less negative effect on future years' budget deficit. Our calculations using 13.97 percent reversed the result and the single ship annual approach had the lesser effect on the deficit.

Although we have demonstrated here that the cost difference of 10 percent in the two funding approaches can be reduced or negated, such comparisons involve only the estimated cost of the alternatives. The Navy puts much more emphasis on the improved delivery schedule offered by the multiship approach. The need for the carriers within the schedule offered by this approach is the driving factor rather than the potential savings. The Navy also believes that the multiship approach will strengthen the shipbuilding industrial base. We believe there are potential savings which will accrue to the CVN-71 if the commitment is made to fully fund the CVN-72 and CVN-73 in fiscal year 1983. The extent of these savings depends on how far along in construction the CVN-71

is when the CVN-72 and CVN-73 are phased in. Additional savings may accrue to the three ships because of productivity improvements which may be achieved if the commitment is made now for the two carriers.

FUNDING ALTERNATIVES TO
FULLY FUNDING CVN-72 AND
CVN-73 IN FISCAL YEAR 1983

Alternatives to fully funding the two carriers in fiscal year 1983 do exist. The single ship annual approach and incrementally funding the carriers are two. If the single ship annual approach is used, which the Navy used as a basis of comparison to the multiship proposal, the projected improved delivery and cost avoidance is lost.

Early in its preparation of the fiscal year 1983 budget, the Navy proposed a plan to incrementally fund the two carriers. Table 2 shows the funding profile for this proposal. Though not a legal requirement, there has been, since the early 1950s, an agreement between DOD and the Congress, implemented through DOD directives, that Navy ships would be fully funded in a single year. Using their proposed incremental approach, the Navy projected essentially the same improved delivery and cost avoidance and outlays as if fully funded. However, a problem with incremental funding is that funds planned to be budgeted in future years may not be. This may cause disruptions in a program and such instability may cause schedule delays and cost overruns. The Office of the Secretary of Defense and the Office of the Management and Budget told the Navy that the full-funding concept should be used to request funding for the CVN-72 and CVN-73.

Table 2Incremental Funding Profile for CVN-72 and CVN-73

<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>FY 85</u>	<u>FY 86</u>	<u>Total</u>
\$658	\$1,306	\$3,292	\$ -	\$2,033	\$7,289
Some nuclear and nonnuclear long lead for CVN-72, some non-nuclear long lead for the CVN-73, and some prefabrication for both the CVN-72 and CVN-73 (note a).	Some nuclear and non-nuclear long lead and prefabrication for both the CVN-72 and CVN-73.	Remainder required to fund the CVN-72. Some nuclear and nonnuclear long lead and some prefabrication for the CVN-73.		Remainder required to fund the CVN-73.	

a/The Congress disallowed \$183 million for some nonnuclear long-lead components in its fiscal year 1982 budget.

CONCLUSIONS

The Navy is projecting that by fully funding the CVN-72 and CVN-73 in fiscal year 1983

--each carrier can be delivered 22 months early and

--a cost avoidance of \$754 million (about 10 percent) can be achieved.

We found improved delivery of 22 months is reasonable under the assumptions used by the Navy and can be achieved if the certain events happen as planned. These events are:

--The Navy must award

--sufficient research and development funds to the contractor in spring 1982 for planning purposes,

--a long-lead contract in October 1982, and

--the basic construction contract by January 1983.

--The contractor must

--deliver the CVN-71 earlier than the February 1988 contract delivery date and

--quickly begin and then effectively implement the planning necessary to phase in the CVN-72 and CVN-73 with the CVN-71 to achieve optimum labor, material and work flow, and optimize facilities use.

If one or more of these events do not occur, the projected delivery dates of the CVN-72 and CVN-73 could slip.

According to the Navy, it can achieve a 10 percent, or \$754 million, cost avoidance using the multiship approach instead of the single ship annual approach. We believe that the Navy's estimate of the cost avoidance of \$754 million, or 10 percent of the estimate cost, is reasonable based on our analysis of their cost estimating assumptions and techniques. However, when the interest costs associated with the funding differences are considered and these differences are expressed in terms of their present value, the claimed cost avoidance is reduced or even negated. This consideration does not account, in dollar terms, for the value of the early delivery made possible by the multiship approach.

As discussed with your offices, due to time constraints, we did not obtain official DOD comments on this report.

As arranged with your offices, unless the contents are publicly announced earlier, we plan no further distribution of this report until 30 days from the date of the report. At that time we will send copies to interested parties and make copies available to others upon request.

for Milton J. Fowler
Comptroller General
of the United States

Enclosure

CVN-72 AND CVN-73ESTIMATE OF OUTLAYS

<u>FY</u>	<u>A</u> <u>Single ship</u> <u>annual approach</u>	<u>B</u> <u>Multiship</u> <u>approach</u>	<u>Delta</u> <u>(B to A)</u>
	------(millions)-----		
1982	\$ 72	\$ 72	\$ -
1983	210	235	25
1984	422	482	60
1985	524	780	256
1986	774	929	155
1987	1,102	1,374	272
1988	1,246	1,423	177
1989	1,246	1,092	-154
1990	1,115	655	-460
1991	785	175	-610
1992	354	53	-301
1993	112	-	-112
1994	<u>62</u>	<u>-</u>	<u>-62</u>
Total	<u>\$8,024</u>	<u>\$7,270</u>	<u>-\$754</u>