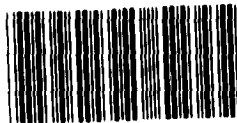


United States General Accounting Office  
Washington, D.C. 20548

108301

WMM



108301

FOR RELEASE ON DELIVERY  
Expected on Wednesday,  
January 3, 1979

Statement of  
JEROME H. STOLAROW, DIRECTOR,  
PROCUREMENT AND SYSTEMS ACQUISITION DIVISION

GAO 00270

before the  
Subcommittee on Priorities and Economy in Government  
Joint Economic Committee

TNT 00708

on

The [Navy's FFG-7 Class Frigate Shipbuilding  
Program, and Other Ship Program Issues]

Mr. Chairman and members of the Committee, we are pleased to appear here today to discuss some key aspects of our work on the Navy's shipbuilding program--in particular, the FFG-7 class frigate program.

We have been greatly concerned over the serious difficulties that the Navy's shipbuilding program has been experiencing over the past several years. As you know, the program has been characterized by significant cost growth, schedule delays, shipbuilding claims, and deficiencies in the performance of naval ships. This situation has raised considerable concern about the effectiveness of the program

003157

Testimony

and has resulted in numerous congressional inquiries into the reasons and possible solutions. The lack of significant progress in recent years has affected the Navy's ability to get approval and funding for its recommended ship program and has resulted in concern over the shrinking number of active combat ships.

For the past several years we have been examining the cost, schedule, and effectiveness of several Navy ship acquisitions, including the FFG-7 class. In addition, we have recently studied the survivability of naval surface combatants, and are currently doing a review of issues related to the Navy's ship acquisition process.

I would like to highlight several matters dealing with the Navy's shipbuilding program. These include:

- issues related to the cost, performance and effectiveness of the FFG-7;
- the survivability of present and planned naval ships; and
- our ongoing review of issues which relate to the Navy's ship acquisition process.

#### FFG-7

The FFG-7 Guided Missile Frigate (Oliver Hazard Perry Class) is to become the backbone of the Navy's sea control fleet by the mid-1980s. The frigates are required to

protect sea lines of communication, and to insure the reinforcement and resupply of U.S. deployed forces and overseas allies. The ships will be specifically employed in areas of moderate threat to protect convoys, underway replenishment groups, and amphibious forces in areas against attacks by enemy aircraft, submarines, and surface ships.

The ship's weapons will consist of the surface-to-air STANDARD missile, the antisurface ship HARPOON missile, the 76 millimeter gun, MK-46 torpedoes, two antisubmarine warfare helicopters and the PHALANX close-in weapons system to defend against antiship missiles.

Two hundred and two million dollars was authorized by the Congress for the lead ship. Detailed design of the FFG-7, then known as the Patrol Frigate, began in May 1973. The \$94.4 million lead-ship construction contract was awarded in October 1973 to Bath Iron Works Corp., Bath, Maine. Construction began in March 1975, and the lead ship was delivered in November 1977. *CNG 01854*

In February 1976, the Navy awarded contracts to Bath Iron Works and to two Todd Shipyard Corporation yards--one in Los Angeles and the other in Seattle--for construction of 11 follow-on ships. Additional contracts have since been awarded to these yards, with a total of 29 FFG-7 class frigates now under contract, including three for the Royal Australian Navy. *DLG00116*

The 1973 estimate for a total program of 50 ships was \$3.2 billion, with an average unit cost of \$64.8 million. The Department of Defense estimated at September 30, 1978, that the cost of a 52-ship FFG-7 program would be \$10.1 billion, an average cost per ship of \$194 million.

Two primary factors causing this increase are: the addition of equipment that was not included in the original cost estimate such as a towed sonar, fin stabilizers and electronics equipment; and much higher than anticipated shipbuilding costs.

#### Stern redesign

We have recently learned that the FFG-7 frigates are undergoing an extensive stern redesign to enable the ship to accommodate the LAMPS-MK III helicopter, its haul-down system, and the towed sonar system. The Navy plans to incorporate this modified stern into the fiscal year 1979-1980 ship design packages. It does not plan, however, to incorporate the modification directly into the 26 U.S. FFG-7 class frigates already under contract, but intends to retrofit the changes into the ships at some point after delivery.

The LAMPS-MK III helicopter, its haul-down system, and the towed sonar system were not developed when the FFG-7 was designed in the early 1970s. However, weight and space were reserved on board for a haul-down system,

and space was reserved for the towed sonar. By early 1977, as the design for the sonar and the helicopter haul-down system began to firmup, it became apparent that the compartments and bulkheads in the entire stern section below deck would have to be rearranged to install these systems on the ship.

A change in the landing pattern of the LAMPS-MK III helicopter also affected the stern design. For safety reasons, the helicopter will be landing straight-in from the stern, rather than obliquely as was the case before. All equipment positioned on the ship's fantail will have to be removed because it could interfere with the helicopter's landing approach. To accommodate this equipment, the FFG-7 class frigate's transom will be tilted and a "step"--extending rearward 6 to 10 feet and recessed 25 inches below the main deck level--will be added to the stern.

The Navy knew, at least as early as September 1976, that the stern would require modification. Despite this the Navy did not analyze the economic feasibility of incorporating the modified stern into all, or some, of the first 26 U.S. FFG-7 frigates during their construction. Nor did the Navy contact the shipyards to determine whether the stern modification could be incorporated into all, or some, of the first 26 U.S.

follow ships during construction, and what cost and schedule effect this action might have on the ships involved.

The Navy has tentative plans to begin retrofitting the first 26 U.S. FFG-7 class frigates in 1985. A Navy best guess estimate, developed in early 1978, indicates that it will cost at least \$7.2 million per ship to retrofit the modified stern into the ships. Navy representatives told us that such a retrofit could result in each ship being drydocked 6 to 12 months or longer.

We recently wrote to the Secretary of Defense expressing our belief that the Navy's decision to defer incorporating the modified stern until the ships covered by fiscal year 1979-1980 contracts ships was made without considering all relevant factors. As of October 1, 1978, fabrication on 12 of the first 26 U.S. ships had not yet begun. The Navy estimates that construction on these ships--from start of fabrication to delivery--will average 2 1/2 years to 3 1/2 years each, with the final FFG scheduled for delivery in January 1983. Since the Navy is scheduled to have detailed design drawings for the stern modification by June 30, 1979, we questioned why the Navy has not planned to incorporate this modification into at least some of these ships during their construction.

We recommended that the Secretary of Defense determine whether the modified stern can be cost

effectively incorporated into at least some of the FFG-7 class frigates under contract during their construction rather than retrofitted after construction.

There are some additional aspects of the FFG-7 program about which we have concerns.

#### Limitations affecting performance

From the inception of the FFG-7 program, the Navy has recognized a need for a large number of these frigates to replace World War II destroyers retiring from the fleet. In order to meet this numerical requirement, stringent design controls were placed on the size and cost of the FFG-7. Keeping down size and cost naturally led to some sacrifices in operational effectiveness, most of which appear to be good management decisions. There are several areas where cost constraints may unduly effect operational effectiveness--but this remains to be seen.

Four matters that merit discussion today are (1) the selection of the short-range AN/SQS-56 hull-mounted sonar, (2) the decision to include only minimal space, weight, and stability margins for modernizing the ship, (3) operation and maintenance of the ship, and (4) ship survivability.

#### Short-range, Hull-mounted Sonar - AN/SQS-56

In preliminary design, the SQQ-23 sonar was selected as the FFG-7 hull-mounted sonar. The Navy, however, later decided to replace it with the AN/SQS-56 sonar.

The decision to change to the 56 sonar was based on cost, space, and personnel considerations and the decision to add the capability to handle a second LAMPS helicopter. The 56 is a less costly, less effective system, which has since encountered serious developmental problems. The Navy has been upgrading the system to overcome its effectiveness and suitability deficiencies.

The primary threat to the FFG-7 and its escorted forces will continue to be Soviet submarines armed with both torpedoes and missiles. Overall protection will, therefore, depend largely on the effectiveness of the FFG-7 frigate's anti-submarine warfare systems. Since the 56 sonar is only a short-range active sonar, the ship depends on the development of towed sonar for longer-range submarine detections. Until the towed sonar is approved for service use, the FFG-7 frigates will have to rely on the short-range 56 sonar.

The improved 56 sonar recently underwent tests at sea. The test results indicated that it is operationally effective against its primary target and thus has been provisionally approved for service use pending determination of its reliability. However, since the system did not meet all of its operational performance criteria, a waiver was issued so production could begin. The Office of the Secretary of Defense will



review the results of the follow-on test and evaluation in the fall of 1979 to confirm the operational suitability of the 56.

The Navy believes that the FFG-7 with the improved 56 sonar and two LAMPS MK-1 helicopters, operating in conjunction with other ASW forces, will be an effective ASW platform. We have serious reservations about that position. With towed sonar and a LAMPS-MK III, the FFG-7 will be considerably more effective in prosecuting submarines at longer ranges.

#### Modernization potential

Modernization potential is the ability of a warship to accept new equipment to avoid obsolescence. The long life of warships (25 or more years) and relatively short life of systems installed on the ships (7 to 10 years) makes modernization potential important. Over its lifetime, a warship will usually have much of its original equipment replaced by new, more capable systems.

From the outset of the program, space, weight, and stability margins for growth in the FFG-7 have been minimized. The low margins are linked to the Navy's determination to restrain the size and cost of the ship. As a result, the FFG-7, unlike most new warships, is unable to accommodate any new equipment beyond what is planned, unless compensating removals are made. The

two areas of particular concern are the reductions in (1) the service life weight margin, and (2) the future growth margin.

The service life weight margin allows for weight increases occurring during the life of the ship. Normally, the margin for a ship this size would be about 150 tons. The margin in the FFG-7, however, is only 50 tons, or 100 tons less than normal.

The future growth weight margin is established to allow for unknown, but anticipated future modifications and new equipment approved by the Chief of Naval Operations. This margin is intended to make new ships more adaptable to changing requirements, the increasing threat, and changes in technology. In the FFG-7, there is no margin for unplanned future ship characteristic changes which require additional space or increases in the ship's weight.

In addition to the tight weight margins, opportunities for future growth are even further constrained by very limited space on the ship. These space limitations could make some necessary future improvements impractical if compensating equipment removals cannot be made. This, in turn, could affect the capability of the ship to perform its mission against an increasing enemy threat.

We believe these limited opportunities for future ship modifications are a serious matter because major modernizations are almost always required in order to maintain an effective ship. Historically these modernizations have usually required space, weight, and stability reservations. The absence of weight and space margins for fitting new equipment beyond those already planned means added risk that needed mid-life modernizations to keep the ships abreast of an increasing threat throughout their life will prove impractical.

The retirement of the ocean escorts of the Claud Jones, Courtney, and Dealy classes from the active fleet when they were only 15 to 20 years old are examples of ships with limited growth potential. Not only did the Navy fail to get a full measure of active service from these ships, but while active they contributed less in terms of effectiveness than less cost-constrained designs would have.

#### Operation and maintenance of the ship

The FFG-7 is designed under a logistics support concept that emphasizes reduced shipboard manning. The ship will have a crew of about 70 fewer personnel than the comparable size frigate currently in operation. The lower manning is attained partly through (1) the use of gas turbine propulsion versus steam power used on previous combatants, and (2) the centralization and automation of the control of weaponry and other equipment.

Some naval representatives believe, however, that the manning level of 185 to 191 may not be adequate to meet all of the ship's needs. If this is found to be true and accommodations beyond 191 are required, this will mean that another extensive modification will have to be made to the ship.

### Ship Survivability

As discussed earlier, the FFG-7 class frigate was designed under strict cost and weight constraints. This resulted in a minimum emphasis on providing the ship with protection for carrying out its missions after a "low" level enemy attack, (such as aircraft rockets and 3-inch and 5-inch surface ship projectiles, rather than cruise missiles and torpedoes.) According to a 1975 Navy assessment of the ship's survivability protection, the ship (and other U.S. ships) are quite vulnerable to low level enemy threats. Survivability improvements for the FFG-7 class are being evaluated, and corrective actions are planned. However, opportunities for improvement are limited because the ship is small, there are cost and weight constraints as well as state-of-the-art limitations, and the payoff of all possible changes may not be commensurate with the costs.

### SURFACE SHIP SURVIVABILITY

On the subject of survivability, we have found in a recent review that the Navy's surface combatant ships

are vulnerable to the so-called "cheap kill." A cheap kill occurs when a damaged system on a ship prevents the ship from completing its mission even though there is little or no physical damage to the ship's structure. Although the ship continues to float, it serves no useful purpose. Some of the most common causes of cheap kills include: (1) small metal fragments from near-misses or proximity-fused weapons which destroy exposed, inadequately armored vital equipment and (2) shock from an underwater explosion which damages improperly designed vital equipment on warships. In addition to these cheap kills, we found that protection is also inadequate against chemical and biological agents.

This inability to survive the cheap kill is both unacceptable and avoidable. The Navy recognized the need for improved protection as early as January 1975 when it established a survivability improvement program. This program could have resulted in substantial improvements, but delays in implementing it have limited its effectiveness. Recent congressional interest and complaints from several Navy officials, including the Commander in Chief of the Atlantic Fleet, have apparently increased the attention devoted to this issue. A higher priority has been demonstrated recently by the development of two long-range improvement plans still under

consideration by the Navy. These plans call for an expansion of research and development efforts and improvements to 46 existing ships.

We believe that improvements in both areas are needed, but we are concerned about the adequacy of the efforts planned. Many ships are not scheduled to receive any improvements, and those that will may still be lacking adequate protection. Additionally, the Navy has not made any policy changes to establish survivability as a priority issue or to require that it be considered throughout the life cycle of ships and shipboard equipment.

REVIEW OF ISSUES WHICH RELATE  
TO THE SHIP ACQUISITION PROCESS

We are currently doing a review of issues which relate to the Navy's ship acquisition process.

The objectives of this assignment are to:

- (1) Examine the Navy's management of change for three ship programs (the FFG-7, DD-963, and SSN-688) to determine
  - the nature of changes that have occurred,
  - their cost and schedule impact,
  - the reasons behind the changes, and
  - actions that can be taken to minimize the amount of change allowed to occur after ship construction begins.

- (2) Examine the potential for new and innovative shipbuilding or ship design techniques.
- (3) Assess the Navy's July 1978 "Naval Ship Procurement Process Study."
- (4) Examine Navy and contractor cost estimates.
- (5) Assess the reasons for cost growth on shipbuilding programs.

In summary, Mr. Chairman, we recognize that the acquisition of Navy ships is an extremely complicated and expensive process today. The advent of highly sophisticated electronics and weapons systems makes today's ships much more difficult to design and build than those of the World War II era. Sophistication and inflation together contribute to high costs.

We, as auditors, certainly don't claim to have all the answers to the Navy's ship acquisition problems--but we do think there is much room for innovation and enlightened management. We will continue to put a great deal of emphasis on this subject with a view toward making constructive recommendations to the Department of Defense and the Congress.

Mr. Chairman, this concludes my prepared statement. We will be happy to answer any questions you have at this time.

FFG-7 Guided Missile Frigate Program  
Construction Schedule--October 1, 1978

<u>Ship</u>	<u>Start Fabrication</u>	<u>Lay Keel</u>	<u>Launch</u>	<u>Delivery</u>
FFG-7	1/31/75*	6/12/75*	9/25/76*	11/30/77*
FFG-8	12/12/76*	1/16/78*	11/04/78	12/09/79
FFG-9	1/28/77*	7/13/77*	7/29/78*	2/29/80
FFG-10	2/11/77*	4/29/77*	3/01/78*	3/31/80
FFG-11	1/23/77*	7/17/78*	3/24/79	6/30/80
FFG-12	4/29/77*	12/14/77*	12/16/78	7/31/80
FFG-13	3/06/77*	12/04/78	7/21/79	10/31/80
FFG-14	7/20/77*	8/07/78*	5/05/79	11/29/80
FFG-15	3/13/77*	4/02/79	11/03/79	2/28/81
FFG-16	3/30/77*	7/30/79	2/16/80	5/31/81
FFG-17 (RAN)	5/17/77*	7/29/77*	6/21/78*	8/30/80
FFG-18 (RAN)	10/14/77*	3/01/78*	1/02/79	12/31/80
FFG-19	1/06/78*	12/27/78	12/15/79	4/30/81
FFG-20	2/17/78*	6/21/78*	3/30/79	4/30/81
FFG-21	3/11/79	11/12/79	5/31/80	8/31/81
FFG-22	6/29/78*	12/04/78	8/31/79	8/31/81
FFG-23	6/02/78*	8/8/79	5/10/80	9/30/81
FFG-24	5/29/79	2/25/80	9/13/80	11/30/81
FFG-25	6/04/79	12/19/79	9/13/80	1/30/82
FFG-26	10/07/79	6/09/80	12/27/80	2/28/82
FFG-27	4/12/79	5/14/80	1/17/81	5/31/82
FFG-28	12/12/78	4/02/79	12/28/79	4/30/82
FFG-29	1/20/80	9/22/80	4/11/81	5/31/82
FFG-30	7/16/79	9/17/80	5/16/81	9/30/82
FFG-31	6/11/79	9/04/79	5/30/80	8/31/82
FFG-32	5/04/80	1/05/81	7/25/81	8/31/82
FFG-33	12/17/79	1/21/81	9/12/81	1/31/83
FFG-34	8/17/80	4/20/81	11/07/81	11/30/82
FFG-35 (RAN)	9/12/79	1/02/80	9/26/80	12/31/82

**Notes:**

All dates reflect current estimates for accomplishment except those noted by an asterisk, which are actual dates.

Start fabrication dates for FFG class ships indicate completion of layout, cutting, and shaping of first one hundred tons of hull structure.