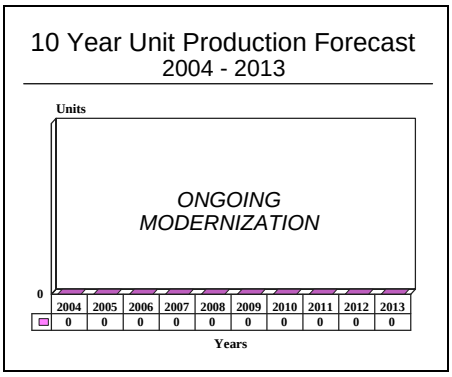
Type 23 Duke Class - Archived 12/2005

Outlook

- Three oldest ships to be withdrawn from service and sold
- Small size and limited hull life limit appeal
- No additional construction planned
- No exports appear likely at this time
- This report will be archived next year



Orientation

Description. Anti-submarine frigate with limited anti-ship and self-defense air warfare capabilities.

Total Produced. A total of 16 ships have entered service.

Sponsor

Ministry of Defence (Procurement Executive)
CB/Admin 3
St. Georges Court
14 New Oxford Street
London WC1A 1EJ
United Kingdom

Pennant List

Name	Builder	Laid Down	Launch Date	Commission Date
F230 *Norfolk*	Yarrow, Scotstoun	12/1985	7/1987	6/1990
F231 *Argyll*	Yarrow, Scotstoun	3/1987	4/1989	5/1991
F229 *Lancaster*	Yarrow, Scotstoun	12/1987	5/1990	5/1992
F233 *Marlborough*	Swan Hunter	10/1987	1/1989	6/1991
F234 *Iron Duke*	Yarrow, Scotstoun	12/1988	3/1991	5/1993
F235 *Monmouth*	Yarrow, Scotstoun	6/1989	11/1991	10/1993
F236 *Montrose*	Yarrow, Scotstoun	11/1989	7/1992	3/1994
F237 *Westminster*	Swan Hunter	1/1991	2/1992	5/1994
F238 *Northumberland*	Swan Hunter	4/1991	4/1992	10/1994
F239 *Richmond*	Swan Hunter	2/1992	4/1993	6/1995
F82 *Somerset*	Yarrow, Scotstoun	10/1992	6/1994	9/1996
F80 *Grafton*	Yarrow, Scotstoun	5/1993	11/1994	5/1997
F81 *Sutherland*	Yarrow, Scotstoun	10/1993	3/1996	7/1997
F78 *Kent*	Yarrow, Scotstoun	4/1997	5/1998	9/2000
F79 *Portland*	Yarrow, Scotstoun	1/1998	5/1999	5/2001
F83 *St. Albans*	Yarrow, Scotstoun	4/1999	5/2000	5/2002

Mission. The primary role of the Type 23 Duke class frigates is to provide anti-submarine (ASW) escort for convoys and task forces, with a secondary role in anti-air (AAW) and anti-surface (ASuW) operations. They also can serve as underway replenishment group escorts.

Price Range. According to the British 1992 Statement on the Defence Estimates, the unit cost of the first Type 23 frigate was US$721.5 million. Subsequent ships were at that time priced at US$283.5 million each. The January 1996 contract for the last three ships put the unit price at roughly US$227 million.

Contractors

BAE Systems plc, http://www.baesystems.com, 6 Carlton Gardens, London, SW1Y 5AD United Kingdom, Tel: + 44 1252 373232, Fax: + 44 1252 383991, Prime

Swan Hunter International Ltd, Newcastle Upon Tyne, Wallsend, NE28 6E0 United Kingdom, Second Prime

Thales Underwater Systems, http://www.thales-naval.com, Redfields Industrial Park, Church Crookham, Fleet, GU52 ORD Hampshire, United Kingdom, Tel: + 44 1252 851485, Fax: + 44 1252 851449, Consortium Member

Vickers plc, Armstrong Works, Scottswood Road, Newcastle-Upon-Tyne, NE99 1BX United Kingdom, Consortium Member

BAE Systems Land & Armaments, Munitions & Ordnance, http://www.baesystems.com, Building 20A-1, Southmead Rd, Filton, Bristol, BS34 7RP United Kingdom, Tel: + 44 117 317 3700, Fax: + 44 117 317 3727, Email: media@baesystems.com, Consortium Member

BAE Systems - Underwater Weapons, http://www.baesystems.com, Elettra Avenue, Waterlooville, Hampshire, PO7 7XS United Kingdom, Tel: + 44 0 2392 26 4466, Fax: + 44 0 2392 26 0246, Email: media@baesystems.com, Consortium Member

Technical Data

	Metric	U.S.
Dimensions		
Length	133 m	436.2 ft
Beam	16.1 m	52.8 ft
Draft (average)	5.5 m	18 ft
Draft (over sonar)	7.3 m	24 ft
Displacement		
Full Load		4,200 tons
Standard		3,500 tons
Performance		
Speed, Maximum	52 km/h	28 kt
Speed, Cruise (on diesel-electric)	28 km/h	15 kt
Range	14,450 km at 28 km/h	7,800 nm at 15 kt
Crew	12 officers, 169 enlisted	
Accommodations	186 (includes 16 officers)	

	Type	Quantity
Armament		
Guns	4.5 in L55 Mk 8 Mod 1	1
	Oerlikon/BMARC 30mm L75 GCM-AO3	2
Missiles	Harpoon SSM	8
	Seawolf	32
Lasers	Outfit DEC(3)	2
Torpedo Tubes	Mk 32 fixed	2x2
Torpedoes	Stingray	36
Helicopter	Sea Lynx HAS.8	1
	or Merlin HMA.1	1

	Type	Quantity
Electronics		
Radar – Surface/Air Search	Type 996	1
Seawolf Fire Control	Type 911	2
Navigation	Type 1007	1
	Type 1008	1
Electronics		
Optronic Fire Control	GSA-8B/GPEOD	1
Sonar – Bow-Mounted Low-Freq	Type 2050 active/passive	
Passive Towed Array	Type 2031Z	1
Electronic Warfare		
ESM	Outfit UAF-1 or UAT	1
ECM (not fitted to all ships)	Type 675(2)	2
Decoy Launchers	Sea Gnat/Shield	4
Torpedo Decoy	Type 182	1
COMINT	FH-12	1
Command & Control		
Command System	Outfit DNA(1)	1
Navigation	GPS	2
	Omega/LORAN	1
Communications	Skynet 4/SCOT	2
Propulsion		
Gas Turbines	Rolls-Royce Spey SM-1A/C	2x15,550 shp
Auxiliary Diesels	Paxman Valenta 12RP2000CZ	4x1,750 shp
Electric Motors	GEC	2x2,200 shp
Propellers	Stone Vickers high-screw FP, ∅ 13 ft.	2

Design Features. The Type 23 frigate was originally a response to a perception that the Type 22 Batch III frigates had grown to the point where they could not be produced in the numbers required. The Type 23s are smaller than the Type 22 Batch IIIs and have lower crew requirements. In fact, the crew strength is inadequate to provide routine maintenance, and the ships use contract services for cleaning, etc., when in port. Stores stowage is kept to a minimum in order to reduce demands on hull size. Additional stores therefore have to be carried in the hangar and other non-dedicated spaces.

The hull is slightly wider in proportion to its length than had been customary for British designs. This design provides wider access and more comfortable living accommodation. The space allocated to individual crew members is more generous than in previous British ships, while the common areas (recreation spaces, mess decks, etc.) are substantially larger. The external profiling of the ship means that some of these spaces are unusually shaped, occasionally resulting in inefficient space utilization.

The hull has a deep-vee forward section to prevent slamming, merging into a conventional round-bilge hull form. Stabilization is by integral fin stabilizers combined with high-aspect-ratio bilge keels. The hull is unusual in that it has flare running the whole of its length. Hull plating is substantially thicker than in previous classes. For the first time in a major British warship, the steering controls are on the bridge, not in a separate pilot house. The operations room is buried deep in the hull and is a relatively small T-shaped compartment. This setup is a reflection of the ship's distributed command system, which permits many ship functions to be elsewhere yet in constant electronic contact with the operations room.

The main propulsion system is a Combined Diesel-Electric and Gas Turbine (CODLAG), using a diesel-electric drive system for silent cruising and gas turbines for high-speed sprinting. Four Paxman Valenta 12RP 200CZ 12-cylinder diesel generators drive two GEC direct-current electric motors. The diesel generators are mounted on rafts in the superstructure to help reduce noise and prevent vibration from passing into the ocean. The two sets located below the waterline are fitted with acoustic hoods for quieter running. The electric motors are located behind the gearboxes and surround the propeller shafts. Two SM-1A Spey gas turbines, each with 15,550 shp output, supply the high-speed power, while the diesel generators provide the ship's onboard electrical supplies, as well as the propulsion for slow-speed maneuvering and cruising.

The propulsion plant layout means that the electric motors must remain running even when the ship is using its gas turbines to avoid the problems of inertia and drag. This adds to the design complexity, since the

gearing system has to accommodate the fact that the gas turbines cause the shafts to revolve at a higher rate than would be optimal for the electric motors. The use of electric motors, combined with the location of the diesel generators, means that these ships have the lowest noise profile of any surface ship in the world, a major factor in their unsurpassed ASW capability.

A Main Electrical Power System (MEPS) provides an integrated 660/440 V power supply. It also allows central control of the distribution system, with automatic load sharing, synchronizing and generator starting and stopping. A separate diesel engine is used for emergency services. The gas turbines are located so that they can be removed directly through hatches between the forward superstructure and the funnel, eliminating the need to haul them up through the air intakes, as is usually the case with marine gas turbines.

The maximum speed is quoted as 28 knots. The actual trial speeds of these ships are classified, but unofficial reports credit them with 32 knots over a measured mile without forcing the powerplant. Once the ships change to the Spey SM-1C powerplant they are rated at 30 knots, although full use of the added power is prohibited by gearbox considerations. The range is 7,800 nautical miles at 15 knots. The cruising speed is 17 knots, but towed array operations are conducted between 8 and 12 knots. Accommodation is provided for 185 crew members.

Much attention has been paid to damage control on board. Armor is placed over vulnerable machinery and electronics spaces to prevent battle damage. The ship is divided into five fire zones. These zones, together with the isolated ventilation system, provide the ship with improved damage control capability to prevent the spread of fire, smoke, and toxic fumes. Transverse bulkheads separate these self-sufficient fire zones, each of which has its own damage control center, computer access to the command system, pumps, and firefighting mains. The bulkheads themselves are made of a laminate with a heat-insulating core covered by Kevlar fragment-resistant layers and an STS steel case. Each compartment has fire sensors to assist firefighting teams in judging conditions inside the compartment and taking the necessary actions.

The hull and superstructure are designed to be radar-deceptive, in that the signatures at the bow and stern are exaggerated while the midships are designed with suppressed radar cross-section. Radar-deflecting and/or absorbing baffles are provided in the vicinity of equipment where the RCS cannot be reduced. As a result, a missile using active radar homing is expected to go fore or aft of the center section, making it easier to decoy.

Operational Characteristics. The Type 23's primary anti-surface armament consists of two four-cell canisters for Harpoon anti-ship missiles controlled by a GWS.60 launch complex. The 60-nautical-mile Harpoons are backed up by a 4.5 inch L55 Mk 8 automatic gun mount on the forecastle. This is to be replaced with a Mk 8 Mod 1 gun featuring a 6 ton weight reduction and offering substantial internal space savings. A further development would produce the Mk 8 Mod 2, which would eliminate the feed ring and provide a hoist directly from the magazine to the gun – saving additional internal space but raising safety and damage control questions.

Primary air defense capability is provided by a 32-cell vertical launch system (VLS) for the Seawolf surface-to-air missile, which provides a defense against hostile aircraft and anti-ship missiles. This silo cannot be reloaded at sea, and the Type 23 must seek the assistance of a naval base to reload. The Seawolf missiles are primarily for use in the Point Defense Missile System (PDMS) role, but do have a limited ability to engage crossing targets.

The missiles are backed up by two single-barrel Oerlikon 30mm guns for close-in air defense and anti-small craft operations. These are placed on either side of the funnel. The ships will not carry the 30mm Goalkeeper Close-In Weapons System (CIWS). The AAW armament is completed by two Outfit DEC laser guns, mounted on either side of the hangar. These are tasked with disrupting the guidance systems of laser and electro-optical guided missiles. Outfit DEC has proved very effective.

The ship's primary ASW weapon is its helicopter, carried in a hangar that can accommodate either one Merlin HMA.1 or one Lynx HAS.8 helicopter. The Merlin HMA.1 has its own dipping sonar and sonar processing unit, as well as sonobuoys and four Stingray torpedoes. The Lynx can carry two Stingray torpedoes, but is usually armed with three or four Sea Skua missiles and is tasked with attacking small craft. The ship has four fixed-mounted Mk 32 torpedo tubes for Stingray torpedoes. These tubes are mounted in the hangar, and fire on either beam. This central location was chosen to provide the Type 23 with a central torpedo magazine and maintenance area in the hangar.

The primary sonar system is the Type 2031Z passive towed array. It has excellent resolution and reception, and is capable of broadband and narrowband reception. It is reputed to have third convergence zone capability. The other sonar is the Type 2050, a low-frequency, bow-mounted system with several operating modes and a range of over 16 nautical miles. It has a 3.5 kHz frequency. While used primarily for search and targeting, its passive capabilities can be used during

towed array operations to correlate information received on the towed array. It also has a passive torpedo warning capability.

The primary radar for the Type 23 is the Type 996. This three-dimension surface and air search radar was developed from the Plessey AWS-9. It has an 85-nautical-mile range and is capable of point defense search and coverage against sea-skimming missiles. Type 996 also has an anti-jam function, in which it detects and localizes jamming emissions for fire control purposes. Two Type 911 radars serve as the Seawolf missile guidance and tracking radar. Type 911, a modified Marconi 805SW, receives target designation data from the Type 996, and immediately after launching locks onto the Seawolf missile. The missile and target are then tracked together, the missile being guided via line-of-sight onto the target. A Type 1007 navigation radar is provided, this also controlling the two Outfit DEC lasers. The Type 23 frigates are being fitted with an additional navigation radar, the E/F-band Type 1008, supplementing the I/J-band Type 1007.

The electronic support measures (ESM) system is the UAF-1 Cutlass. It has digitized processing and a preprogrammable threat radar library, which stores 2,000 hostile radar parameters in its computer memory. It automatically compares any detected radar signature with this data. It interacts with the ship's electronic countermeasures (ECM) system, consisting of a Type 675(2) jamming unit and four Sea Gnat chaff launchers. The Sea Gnat can also use infrared decoys. Outfit UAF(1) reportedly proved unsatisfactory in service and was subjected to a major upgrade in 1993. It is being replaced in later ships by the Thorn-EMI-designed Outfit UAT ESM system. Racal Thorn Defence Systems is now producing this system following Racal's acquisition of the Thorn-EMI Sensors Division. Although provision is made for the ships to mount the Type 675(2) jammer, shortages of the Type 675(2) mean that few (if any) Type 23s have been fitted with these systems. Type 675(2) has not performed as well as the Royal Navy had expected, and a new system is being designed to replace it.

The navigation system relies primarily on the Global Positioning System (GPS) and GLONASS backed up with an integrated navigational system that can exploit Omega and/or Loran. A sophisticated moving map chart display is also provided. In spite of this sophisticated setup, a manual chart plot is maintained to make sure that the Navigating Officer is able to retain control if the electronic systems fail. It also serves to ensure that basic manual navigation skills are not lost.

The communications suite includes the SCOT satellite communications terminals for the Skynet 4 system. The internal and external communications are integrated using the ICS-6 communications management system. Most aspects of this system are classified, but unofficial reports refer to an ability to monitor, de-interleave, and record more than 400 radio communications channels, and to obtain directional cuts on the sources of those transmissions. The system is also unofficially reported to act as a telephone exchange by which command system operators at one functional terminal can communicate with other terminals on the same ship or with other ships in the formation. This implies some form of message prioritization protocol to prevent a communications overload. The ships are, or will be, fully equipped for Link 11 and Link 16 (JTIDS), and may be equipped with the U.S. Challenge Athena system for direct receipt of satellite imagery.

The Outfit DNA command management system slowly approached Full Operational Capability in the mid-1990s. The first ship to receive the full hardware and representative software system was HMS *Westminster*, although HMS *Iron Duke* received the first hardware and HMS *Monmouth* and HMS *Montrose* are both involved in hardware trials. Full Operational Capability was achieved by mid-1997.

Outfit DNA links multifunctional consoles in the operations room with the computer room through a single fiber-optic Local Area Network. The fiber-optic LAN has considerable built-in extra capacity, with only 30 percent of its data transmission capacity being currently used. Dual input/output nodes link Outfit DNA to the sensors and weapons. The I/O nodes provide the interface for the raw data generated by the ship's sensor systems. Local data storage and processing are distributed throughout the system. A typical Outfit DNA processing configuration incorporates some 280 32-bit processors. BAeSEMA has taken care to include enough processing capacity to meet the sophisticated demands of modern weapons systems and sensors and to provide the expansion capability to match future demands.

Outfit DNA uses high-resolution color graphics and built-in human-computer interface facilities, the first British surface naval command system to have multifunction common consoles in color. The individual consoles display the overall tactical situation or further process the data to provide specific information.

HMS *Westminster* Type 23 frigate

Source: Stuart Slade

Variants/Upgrades

Although no official distinction is made between them, the frigates of the Type 23 program were built in two groups, the first seven being completed to interim standard with the Spey SM-1A gas turbines, Outfit UAF-1 EW equipment, and no command system. From HMS *Westminster* onward, the ships were completed to definitive standard with Spey SM-1C gas turbines and the full DNA command system along with the Outfit UAT ESM equipment. An accelerated program brought the interim group up to definitive standard. In addition, all ships of this class are to receive the COBLU upgrade of the SSQ-108(V)2 Outboard II COMINT array in place of the existing FH-12 system. This part of the program has been delayed for financial reasons.

Three ships have received the Type 2081 variable depth sonar in place of their towed array. This is believed to be the French TSM-2640 Salmon and is probably part of a trials program. It is not known for how long this fit will be maintained.

Stretched Type 23. During the late 1990s, there were reports that a version of the Type 23 frigate was proposed to replace the now-defunct Project Horizon CNGF. There was no truth in these reports, which probably represented echoes of the decade-old Type 23-AAW and GP Type 23 projects. In reality, the Type 45 Daring class, which will replace the Type 42 destroyers, has little in common with the Type 23 and only uses some of its systems as a development base.

AAW Design Studies. From 1990 to 1992, a series of design studies to produce an AAW version of the Type 23 was conducted. These started with the basic Type 23 hull, and enhanced capability by progressive stretches of the hull. None of the designs were satisfactory, and all were rejected without additional discussion. These exercises proved that any AAW ship would require a new hull design, and led to Project Horizon and, ultimately, the new Type 45 Daring class destroyers (see report).

GP Type 23. Suggestions were once circulated that a general-purpose derivative of the Type 23 might be ordered. These were said to have enhanced Seawolf magazines and helicopter-carrying capacity at the expense of the towed array and other ASW-oriented features. As a result of the collapse of Project Horizon and the rapid progress being made with the Type 45 destroyer, this proposal was never seriously considered.

SLEP Options Considered. It was reported in the spring of 1999 that the MoD was considering Service Life Extension Program (SLEP) options for the Type 23 class in order to extend the effective service expectancy of these ships beyond their originally designed 18-year hull life. When the Type 23s were designed, it was intended that they would not receive a major midlife upgrade. The intention instead was to discard the ships after a relatively short effective hull life, and replace them with a new type of ship.

The Integrated Project Team (IPT) has presumably initiated conceptual studies for a possible SLEP that would extend the life of these ships to 25 years. This could involve enhancing the hull structure, increasing the onboard power generation capabilities, and possibly replacing obsolete machinery. The intention is to produce a quick, surgical, and low-cost upgrade instead of the major midlife overhauls performed in the past. One of the first steps in that direction is said to be the refit of the Type 2087 active/passive sonar system, providing the ship with improved littoral ASW capabilities.

Type 2087 Retrofit. A new low-frequency active/passive sonar system is being developed for the British surface ships, including the Type 23 Duke class. This is a major undertaking involving all the key defense contractors (Lockheed Martin Ocean Radar and Sensor Systems, Babcock Defence Systems, and Thomson Marconi Sonar Ltd), and is considered critical to the strategic capability of the European defense industry in general. This system, when ready, is intended to be retrofitted on the 16 Type 23s starting in 2004, and is baselined for the Future Surface Combatant as well. The contract to develop Type 2087 was awarded to Thomson Marconi Sonar Systems in April 2001.

Type 996 Radar Upgrade. The Type 996 surveillance radar systems, introduced in 1984, are being upgraded on board the British surface ships, including the Type 23 frigates. BAe Defence Systems won two contracts worth a total of nearly US$49 million in early May 1999 for the Availability Improvement Program for these radars. The intent is to boost the radars' operational availability by improving their cooling system, since the ships' dry air and chilled water supplies are inadequate for complete servicing of these systems.

The second contract was for a new-generation Track Extractor in the 996 radars. This system will include new commercial off-the-shelf (COTS) processors that will provide better tracking with substantially lower false track alerts while improving reliability and reducing through-life costs. The modifications will be carried out *in situ* while the ships are at sea, which is the new practice assumed by the UKRN for updating key subsystems on above-decks equipment.

Program Review

Background. The Royal Navy began considering new designs for an anti-submarine frigate in the mid-1970s. The oldest Leander class frigates were approaching their midlife points, and a replacement design was needed. The Type 22 frigates then being ordered were viewed as excellent ships, but too costly for mass production. An initial design, Type 24, was intended to meet both the Royal Navy's requirements and the overseas export market, but did not meet required standards and was eventually abandoned.

An Initial Outline Staff Target, presented in June 1979, called for a lightly armed ship with a towed array sonar. This design was finished in June 1981 and designated Type 25. (Readers are cautioned that design Type numbers in the Royal Navy are frequently duplicated, and those assigned to unsuccessful or intermediate proposals are often reused later for totally unrelated proposals. Although there is a system behind the Type numbers, it is frequently misused.) The Type 25 had a 328 foot hull and a 2,000 ton displacement, carried two surface-to-surface missiles, and had a towed array sonar and a small helicopter deck. It had a unit cost of GBP70 million in September 1980 pounds. The Type 25 was to be a surveillance and submarine detection platform, with submarine destruction left to other ships, helicopters, and maritime patrol aircraft. Vosper Thornycroft and Yarrow Shipbuilders were invited to submit designs to meet these requirements in June 1981.

The Royal Navy's design teams wanted changes, and a new Naval Staff Requirement drawn up in March 1982 called for a 2,500 ton ship, 377 feet long, with a helicopter hangar and the Seawolf Point Missile Defense System (PDMS) for self-defense. This was quickly replaced by a new and much more elaborate design that reflected the demands of the U.S. Maritime strategy. The Type 23s were now expected to head north to the Greenland Sea, initially to destroy Russian cruise missile submarines assigned to attack the U.K. Once this was achieved, the British ASW groups would provide cover for the U.S. carriers moving to attack the Russian installations around North Cape. The oft-reported suggestion that the changes in the Type 23 design were a result of the Falklands campaign is incorrect, as they predated that event.

In April 1983, Yarrow Shipbuilders received a contract to produce a detailed design study and drawings. The Royal Navy began issuing contracts for long-lead items several months later. The order for the first ship, HMS *Norfolk*, was announced in October 1984. Yarrow planned to lay the keel for *Norfolk* in July 1985, but shortages of funds and the need to perform work on four Type 22 frigates delayed this until December 1985.

The Ministry of Defence (MoD) and the Royal Navy announced in October 1985 that Swan Hunter Shipbuilders, Wallsend-on-Tyne, would be the second yard building Type 23s. The Royal Navy had planned

to order the second, third, and fourth ships in late 1985. Lack of funds forced a delay in these orders until July 1986, when two ships were ordered from Yarrow and one from Swan Hunter. The total value of the two orders was GBP345 million. HMS *Norfolk* was launched in July 1987. The keels for the HMS *Argyll*, HMS *Marlborough*, and HMS *Lancaster* were laid in 1987.

The Pakistani government had been holding discussions with the Royal Navy and the MoD since 1983 about the purchase of three frigates. The Pakistanis initially were interested in ordering three Type 21 Amazon class frigates, with two to be built in Britain and one in Pakistan. These discussions foundered in early 1986 because of Pakistan's lack of funds. Further discussions were held in late 1986 and early 1987 about the purchase of three Type 23 frigates. These also foundered.

In the summer of 1987 the Type 23 program suffered a problem related to its command system. In August 1987, the MoD canceled a contract with Ferranti Computer Systems for the CACS-4 command system. This had suffered an inappropriately early technology freeze, and was now outdated and very short on computer processing power. Instead of immediately naming a replacement contractor, the MoD awarded US$4 million study contracts to two rival consortia, led by Ferranti and Plessey. The contracts called for the companies to undertake project definition studies to design a new command system. CAP also had entered a bid for the project.

This contest was to take two years. At the Royal Naval Equipment Exhibition held in September 1987, the Royal Navy announced that the first two, and possibly the third and fourth, Type 23s would be commissioned without their command systems, rather than delaying the commissionings until the systems were ready. In August 1989 the MoD awarded a Dowty-Sema/Racal consortium a contract worth approximately GBP125 million to supply the Surface Ship Command System, a version of the Successor command and control system.

The system was not planned to have Full Operational Capability until mid-1996. This delay was accepted as the price of gaining the most advanced technology possible. Those Type 23 frigates not receiving their system would be unable to operate their Seawolf missiles to full efficiency. A lash-up fit was devised which enabled the ships to engage a single target at a time with Seawolf, but there was no prospect of multitarget engagement capability until the command system was installed. The other weapons systems, including the Harpoon missiles, the 4.5 inch gun, and the torpedo tubes, would have reduced operating capabilities. The most serious deficiency was the lack of automated sonar processing capability, which forces the use of manual track-keeping.

While these costs were serious and had significant operational repercussions, they did have an unexpected benefit. The existence of highly advanced ships without command systems meant that those ships could be used as trials vessels to test new concepts and developments in command system technology. Between 1989 and 1996, the Type 23 frigates received a succession of brassboard systems intended to explore various aspects of developing command system and electronic technology.

In mid-1987, the Royal Navy announced plans to order as many as 24 Type 23s, with some of the later ships being built to a modified design. In fact, this announcement was a typically ambiguous statement of a new program. The force level of the Type 23 fleet had already been set at 16 ships, and no increase was ever contemplated. The eight ships in question were to be a new design, based on the Type 23, but modified for area air defense operations as replacements for the existing Type 42 destroyers. The latter had proved unsatisfactory in service and were already known as the Queen's Bad Bargain. Politically, it was impossible to admit that replacements were needed for ships some of which were barely three years old, so the AAW program was presented as an extension of the Type 23 design. This process indirectly led to the Anglo-Italian-French Common New Generation Frigate (CNGF) Project Horizon, and finally to the Type 45 Daring class.

In early 1988, Yarrow and Swan Hunter were asked to bid for the next Type 23 frigate order. Vosper Thornycroft and Vickers/Cammell Laird also bid for the ships. The MoD ordered three Type 23s from Yarrow on July 11, 1988. The order was worth about GBP350 million, with a unit cost of GBP110 to GBP120 million per ship. The MoD said that giving all the orders to one yard saved GBP11 to GBP20 million per ship.

In 1989, the Royal Navy changed the hull number of HMS *Lancaster* from F232 to F229 because the former hull number was unlucky, F232 being the Royal Navy form used to initiate the court-martial of a captain for running his ship aground. Ironically, Type 23 frigates subsequently featured in a number of grounding incidents of varying severity. HMS *Argyll* and HMS *Marlborough* were launched in late 1989, while the next three keels, of HMS *Iron Duke*, HMS *Monmouth*, and HMS *Montrose*, were laid at the same time. The first ship of the class was commissioned June 1, 1990.

In January 1992, a contract was awarded to Yarrow for three additional ships of the class. The keels for these ships, HMS *Grafton*, HMS *Sutherland*, and HMS *Somerset*, were laid during 1992. The 1992 Statement

on the Defence Estimates committed the British government to completing the program of 16 ships and hinted at the possibility of an increase to 18 hulls. Later, long-lead items for the two additional ships were ordered on the basis that they could be used as spares if not required for new construction. This situation remained unaffected by the 1993 Defence Review.

In April 1993, the Swan Hunter shipyard was placed into receivership after the management failed to win a contract to build the new Royal Navy LPH, HMS *Ocean*. This meant that the number of yards building frigates in the U.K. fell to one, the Yarrow yard in Glasgow. VSEL is concentrating on large ships and submarines and Vosper Thornycroft on small craft, while DML at Devonport concentrates on refit, repair, and upgrades. This rationalization meant that the remaining Type 23 contracts would be placed with Yarrow.

Invitations to Tender for the next group of Type 23 orders were issued early in 1994. The tender specified a quotation for the production of four ships of this class, although an order for three seemed to be more probable. This judgment was confirmed in mid-1996 when Yarrow was awarded the construction contracts for the three remaining programmed Type 23 frigates. These three ships have been named HMS *Portland*, HMS *St. Albans*, and HMS *Kent.*

HMS *Westminster* was officially commissioned on May 13, 1994, featuring the newly installed Outfit DNA. While the ship had a complete set of Outfit DNA hardware on board at that time, the software used for the post-commission demonstration was representative only. However, the first phase one operational software was installed by August of that year and was reportedly performing to the Navy's expectations. As a result, the delivery of operational software to three more Type 23 frigates (thus enabling their command systems) was expedited. All ships equipped with the necessary hardware received the software packages by mid-1997. This was about a year later than originally planned, since a 22-month delay accumulated by the middle of the Outfit DNA development program had been partially recovered.

During 1994, a general-purpose derivative of the Type 23 frigate was proposed for a number of export requirements. This version is reported to have an enlarged Seawolf missile capacity, CODAG (Combined Diesel and Gas) propulsion in place of the very expensive CODLAG (Combined Diesel, Electric and Gas), and no provision for a towed array. This design was proposed for the Norwegian and Turkish frigate requirements. It was not successful for either requirement and has now faded into obscurity.

In June 2000, the Royal Navy announced that it was joining the U.S. Navy's Cooperative Engagement Capability (CEC) program and would be integrating the Type 23 frigates into the CEC net. This decision resulted from a multiyear feasibility study, designated Larone, that sought to identify key technologies for future incorporation in Royal Navy warships. CEC was identified as being the most valuable of these technologies, and will be included in the Type 23 frigates as a priority program. A CEC system will also be installed in the Type 45 Daring class destroyers.

In June 2001, HMS *Portland* was commissioned, leaving only HMS *St. Albans* to be completed. This was finally achieved in May 2002, bringing the Type 23 construction program to a close. By this time, the Type 45 destroyer program was moving into high gear and the ships in question were being ordered at a higher rate than originally envisioned – eliminating any possibility of additional Type 23 frigates being ordered.

In June 2002, the Royal Navy awarded a contract to Lockheed Martin for the development and integration of a cooperative engagement capability for the Type 23 frigates. By January 2003, this program had advanced to the Assessment Phase Two point, a process that was scheduled to last for 26 months. Thereafter, main gate approval for the integration of CEC into the Type 23s will be given in mid-2005 for service entry in 2008.

In July 2004, the U.K. government announced that it would be reducing the Royal Navy frigate and destroyer fleet from 31 ships to 25, with the withdrawal of three Type 42 destroyers and three Type 23 frigates. A U.K. Defence Ministry delegation visited Chile the last week of July to make a formal offer of the three Type 23 frigates at a "political price" of less than US$250 million for the lot. These frigates appear to be HMS *Norfolk*, the *Marlborough*, and the *Grafton*. Why the last of these should be on sale is something of a mystery, since she is one of the latest Type 23s. Subsequently, the British government has sweetened its offer by reducing the price for the three ships to US$180 million.

Funding

This program is funded by the MoD for the Royal Navy.

It was reported by the National Audit Office in 1997 that the development costs for the Type 23 program had grown considerably, due to the problems in having to develop a new command system for these ships. According to the report, the development costs had increased from GBP135 million to GBP241 million.

Recent Contracts

Contractor	Award (US$ millions)	Date/Description
Matra BAe Dynamics	603.0	Feb 29, 2000 – Eight-year contract for the supply of Seawolf missiles for Type 22 and Type 23 frigates.
Lockheed Martin	17.5	Jun 12, 2002 – Development of Cooperative Engagement Capability (CEC) for Type 23 frigates.

Timetable

Month	Year	Major Development
	1970	Initial Naval Staff discussions held for a new, low-cost ASW ship
Jun	1979	Initial Outline Staff Target presented
Jun	1981	Outline Staff Target finalized
	1981	Vosper Thornycroft and Yarrow Shipbuilders asked to submit designs
Jun	1982	Naval Staff Requirement (NSR) composed
Dec	1982	Changes made to NSR as a result of strategy changes
Apr	1983	Yarrow receives contract for detail design work
Oct	1984	First Type 23, HMS *Norfolk*, ordered
Dec	1985	HMS *Norfolk* laid down
Jul	1987	HMS *Norfolk* launched
Aug	1987	CACS-4 program canceled
Aug	1989	Dowty-Sema/Racal consortium wins control contract
Jun	1990	HMS *Norfolk* commissioned
Feb	1996	Last three ships of class ordered
May	1998	First refit of HMS *Argyll* begins
May	1999	HMS *Portland* launched; HMS *Kent* undergoes sea trials
May	2000	Last ship (HMS *St. Albans*) launched
Sep	2000	HMS *Kent* enters service
May	2001	HMS *Portland* commissioned
May	2002	HMS *St. Albans* fully operational
	2004	Retrofitting of Sonar 2087 to begin
	2008	CEC to enter fleet service on Type 23 frigates

Worldwide Distribution

U.K. 16 ships completed.

Forecast Rationale

With the delivery of the last ship of this class, the Royal Navy's Type 23 frigate program has shifted from procurement and construction to maintenance and upgrade. At this point in the history of the Type 23, it is

timely to look at some of the lessons learned from this particular program.

In retrospect, the Type 23 class were designed a little too late and a little too small. The first few ships, at least, also showed the malign effects of a Ministry of Defence mind-set that attempted to "save money" by restricting a ship's size and designing her for a limited hull life. The original concept behind the Type 23 was that they would not receive a mid-life upgrade, but would be scrapped and replaced when their on-board systems became obsolete. This mind-set had evolved as a result of the experiences with the Leander class upgrades that had been excessively expensive and produced ships that were limited in both capability and remaining life.

With the Type 23s, the limited size and basic ASW orientation resulted in ships that were simply too small and too specialized to be fully capable in the general-purpose role. Thus, when the Cold War ended in 1991, their unique capabilities were greatly de-emphasized while their shortcomings were highlighted. This factor was most pronounced in the stores provisions. The Type 23 was originally designed to work in close association with supply ships and, in order to reduce hull size, stores capacity was reduced to a minimum. This has now rebounded, in that the ability of the ships to conduct extended deployments has been restricted.

Today they are expected to take on a general-purpose role that was never anticipated by their designers. As a result, the Royal Navy faces a major service life extension program, with the costs implicit in such a major reconstruction. It is probably this impending cost that has resulted in the decision to reduce the fleet by three hulls although the decision to include one late-production ship in the number to be withdrawn is somewhat peculiar.

Once again, the U.S. Navy approach of building larger, more flexible vessels has shown its long-term wisdom. It is much easier to modify a multi-role design to fill a specific tactical purpose than to adapt a specialized design to undertake new roles.

There is no chance that any additional ships of this type will be ordered, and the program is at an end. This report will be archived next year.

Ten-Year Outlook

No further construction is planned, so the forecast chart has been deleted.

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