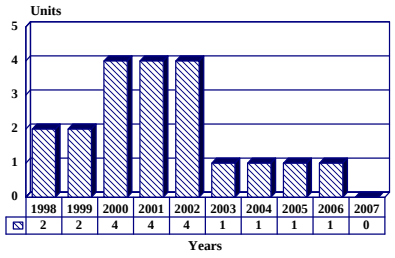
SMCS/Successor - Archived 10/99

Outlook

- In service with the United Kingdom's Royal Navy
- Export variants are available
- Integration of COTS hardware into SMCS kits
- BAeSEMA targeting Australia and other Asia Pacific markets

10 Year Unit Production Forecast
1998 - 2007



Orientation

Description. An integrated command and control system optimized for submarine use. It is designed to provide an integrated system capable of coordinating communications, sensors and weapons systems on all UK Royal Navy submarines.

Sponsor

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Contractors

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Licensees. No production licenses have been granted. The surface ship version in Korea, however, is quoted as having been supplied by BAeSEMA/Samsung, which would suggest a form of technology transfer agreement.

Status. Production and service.

Total Produced. Through 1997, 16 units had been produced. It is estimated that all four Vanguard class submarines had received their systems by mid-1997.

Application. To provide an integrated command system capable of coordinating communications, sensors and weapons systems on all UK Royal Navy submarines.

Price Range. Analysis of contract values indicates that a Vanguard/Trafalgar class SMCS system costs US$15.6 million each.

Technical Data

Design Features. SMCS links multi-functional consoles in the operations room with the computer room through a dual fiber-optic local area network. The fiber-optic LAN has considerable built-in extra capacity. Only some 30 percent of its data transmission capacity is being used at the present level of traffic. In the computer room, dual input/output nodes and dual common service nodes link the SMCS to the sensors and weapons systems and take care of the processing. The input/output nodes provide the interface between the raw data generated by the ship's sensor systems, while the common service nodes and their related storage devices provide the system's master database and higher processing functions. Local data and processing are distributed throughout the system.

A bulk store unit supports the four nodes. In a typical SMCS processing configuration, some 150 Intel-386 32-bit processor chips are incorporated, as are transputer chips. In contrast with some existing systems, 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.

SMCS uses high-resolution color graphics and built-in plasmas, being the first British naval command system to have multi-functional common consoles in color. The individual consoles display the overall tactical situation or further process the data to provide specific information. The remote terminal facility provides an off-line capability for interrogating the system without interfering with the console operators. Software independence from hardware has been made a key feature of the design.

Variants/Upgrades

Outfit DNA. A highly modified and improved version of SMCS has been selected for the Type 23 Command System following a competition with the Ferranti T23 CS. Designated the Surface Ship Command System (SSCS), the equipment was also to have been used upon the Fort Victoria auxiliaries. The UK Royal Navy's selection of SSCS for this role provides a useful level of standardization in the fleet.

Smacks. UK Royal Navy verbalization of the SMCS designation often used in conversation and occasionally even in written material.

SMCS-PLUS. The Batch Two Trafalgar Class (B2TC) submarines will receive an upgraded and improved command system exploiting the technical changes that have taken place since the original SMCS was designed.

Although technically open for competition, UK Royal Navy sources state that the trials of SMCS have been so successful that it is inconceivable that BAeSEMA would not be awarded the contract.

Successor. An export variant of SMCS, the Successor, is available. There are reports that a number of countries purchasing diesel electric submarines are actively considering the specification of Successor as the command system. There are also suggestions that the system may be adopted as retrofit for a number of existing boats.

Program Review

Background. The competition to provide the new submarine command and control system to the UK Royal Navy opened in 1984 and resulted in the contract for the development of SMCS. The first 14 were ordered in April 1986, accompanied by SMCS software deliveries. The initial sets outfitted the new SSBNs

HMS *Vanguard*, *Victorious* and *Viligant*; seven Swiftsure and Trafalgar class SSN refits; the team trainer at Faslane; a hardware reference set; and a maintainer trainer. Although Ferranti was expected to win this contract, it was won by Gresham-CAP which had been formed five years earlier specifically to compete in the naval command and control system sector. Prior to winning the SMCS contract, Gresham-CAP had been awarded a US$8.0 million contract for the DCG tactical support computer system, 37 examples of which have been delivered. The contract was a fixed-price agreement, including the development of the system and the delivery of a shore-based development facility (SDF) and an initial production batch.

The company producing Successor has gone through several name changes in recent years. The SMCS development contract was won by Gresham-CAP. Gresham was then taken over by Dowty, making the company name Dowty-CAP. The CAP group then merged with Sema-Matra to form the Sema group. Dowty-CAP started trading under the name Dowty-Sema on June 1, 1989. British Aerospace then formed a joint venture with SEMA making the group (in theory) Dowty-BAe-Sema, although the Dowty-Sema name was retained in practice. Subsequently, Dowty was taken over by TI International which sold its interest in the joint venture to BAe and the group took on its present identity of BAeSEMA.

By June 1989, the first set of systems cabinets had been delivered and the rest were being manufactured in full accordance with the production delivery schedule. Design of the SMCS electronic card set was complete, including the design of the highly complex Application Specific Integrated Circuits (ASICs). Software development was supported by the use of target-compatible prototype cards, with development well advanced on the first two major software releases. A powerful and sophisticated Project Support Environment (PSE) had been built up to support the software development program with a comprehensive range of tools and facilities.

In June 1990, the first equipment successfully achieved its Part Naval Weapon Harbor Trial (Equipment) rating at the Trident Tactical Weapon System Shore Development Facility. The company had also achieved its first Production Standard in its development of SMCS kits, the equipment in question being accepted by MoD (PE) for delivery to HMS *Vanguard*, Britain's first Trident submarine.

In March 1992, HMS *Vanguard* was launched in an advanced stage of completion and started sea trials by the end of that year. In March 1993, the House of Commons Defence Committee received a report on the preliminary sea trials of HMS *Vanguard*. This testimony confirmed that the Type 2054 sonar is still four years behind schedule and that the submarine is unable to fire torpedoes due to the missing software. The deficiency has sometimes been presented as being a fault with the SMCS command system but this is inaccurate; the root of the problem is with the Type 2054 subsystem.

The July 1993 Defence White Paper confirmed that the four diesel-electric Upholder class submarines were to be sold out of service as an economy measure. This presumes that they will retain their existing command systems and that the orders for SMCS systems to equip these boats will be transferred to the Trafalgar class submarines. The Defence White Paper also confirmed that the Batch 2 Trafalgar class would be restricted to a single hull (a decision subsequently reversed) and that the UK force level would be held at 12 nuclear-powered hunter-killers and four ballistic missile submarines.

Tenders for the construction of the Batch 2 Trafalgar class submarines were requested with bids being invited for between three and five boats. Current long-term costings suggest that the class will be three submarines and will be minimum-change versions of the existing Trafalgar design, the major difference being the adoption of the PWR-2 reactor train.

HMS *Vanguard* started to run sea trials during late 1993 and early 1994, culminating in the test-firing of a Trident ballistic missile. The results of these trials were that the SMCS system proved successful beyond any reasonable expectations, and proved to have a level of capability substantively greater than anticipated.

In May 1994, the MoD ordered nine more SMCS kits. HMS *Sovereign* and HMS *Trafalgar* were the first two SSNs to receive SMCS. SSNs with modernized sensor and combat systems (under the SSN Update I program) received SMCS Release 5 software. (This version is also being fitted to Vanguard class SSBNs.)

The Update I program, also known as the Initial Phase, used to be called phase 1 and 2 of the Swiftsure and Trafalgar (S&T) mid-life upgrade. Upgrade I includes six SSNs (believed to include Sovereign, Trafalgar, Turbulent, Superb, Tireless and Splendid). The Release 5 upgrade includes a modified SMCS to interface with sonar improvements, added functional improvements and updated hardware.

BAeSEMA won the contract to provide command systems for the KDX class frigates in South Korea. The South Korean navy is now looking at the acquisition of a new class of submarine as a follow-on to the Type 209-1400 class now entering service. By mid-1996, the German Dolphin-mod class (a derivative of the Israeli

Dolphin class) was favored for this requirement, with Successor (the export version of SMCS) strongly supported as the command system for these boats.

In 1998, as the technology of SMCS began to evolve into an open system using commercial-off-the-shelf (COTS) hardware, BAeSEMA is looking to export it to Australia and other Asia Pacific markets. The COTS software and hardware imports the infrastructure to the Solars UNIX system, uses COTS products (Ilog Views) and protocols (X-Windows) and Sun SPARC processor boards.

Funding

SMCS development was funded under a US$127 million contract signed in 1986.

There is a major difference in the administration of development and production contracts between the UK and US. The UK MoD frequently awards a major research, development and initial production contract in a single year, which then acts as a form of drawing account covering expenditures over a number of years. The US practice first funds development that is spread out over several years, before a production contract is awarded.

Recent Contracts

No recent contracts have been identified through public sources.

Contractor	Award ($ Millions)	Date/Description
EASAMS Consortia	16.0	*July 1991* — MoD (UK Royal Navy) contract awarded to a consortium composed of EASAMS, Sema, MUSL and Rosyth Naval Dockyard to act as Weapons Systems Integrator for the Swiftsure and Trafalgar upgrade. This includes the installation of SMCS on these boats.
BAeSEMA	35.0	*June 1994* — The second UK Royal Navy contract for the production of nine more SMCS kits to equip six SSNs on retrofit; the SSBN HMS Vengeance on build; the SSN command team trainer; and the SSN shore integration facility (SIF) I Camberley, UK.
BAeSEMA	15.5	*July 1994* — Contract for Release 5 software for SMCS which includes an interface to improved sonars that are part of the Swiftsure & Trafalgar (S&T) update program's initial phase.
BAeSEMA	45.0	*July 1994* — Contract covers Release 6 to 7 of SMCS, equip seven class SSNs and refit Sonar 2076 Suites to the Trafalgar class SSNs.

Timetable

Month	Year	Major Development
	1984	UK Royal Navy requirement issued
Mar	1986	Development and initial production contract awarded
Mar	1989	First system kits delivered
May	1989	Phased module and subsystem integration undertaken
Oct	1989	First production system delivered
Jun	1990	SMCS Production Standard equipment delivered for HMS *Vanguard*
Jul	1991	Weapons Systems Integration contract for Trafalgar and Swiftsure upgrades awarded.
Mar	1992	HMS *Vanguard* launched
	1994	Successful sea trials completed on HMS *Vanguard*
Jun	1994	Follow-up order for nine more submarines
Jul	1994	Two major orders for upgrading the software and improving hardware compatibility with enhanced graphics processing capabilities (Release 6)
	1995	Software upgrade (Release 7, which includes an interface to Sonar software 2076 and

Month	Year	Major Development
		TWSH and updated consoles
	1998	Integration of COTS hardware into SMCS

Worldwide Distribution

UK. The SMCS system is currently outfitted on four Vanguard class ships, seven Trafalgar class ships, and five Swiftsure class ships.

Forecast Rationale

SMCS represents a major advance in tactical data handling for submarine applications. It has provided the UK Royal Navy a fully integrated combat system that is equivalent to the US Navy's BSY-2, but at a much lower cost with greater capability. So far, the SMCS has been integrated on the UK Navy's four Vanguard SSBMs and its Trafalgar and Swiftsure class SSNs.

The older Upholder class boats, which were fitted with earlier command control systems, were supposed to be retrofitted at a later date with the SMCS system, pending its availability. However, the British decided to sell these hulls and the upgrade plan was abandoned. Whether the terms of any Upholder sale will include a refit by the new customers with the export version of SMCS, the Successor, is an open question. It is doubtful, however, considering the amount of effort required to refit an existing submarine hull with a new command system.

The export of the UK Royal Navy version of SMCS is highly unlikely due to security and cost reasons; however, the export-oriented Successor version may very well have considerable potential in the export market. Diesel-electric submarines have become commonplace in the world's navies, with many deliveries having taken place in the 1970s and 1980s. All of these boats will soon need a midlife refit. Such refits are likely to include revisions to the weapons systems, including provisions for subsurface-to-surface missiles and more advanced and reliable torpedoes. Major upgrades and changes to the sensor systems are also likely, with an essential part being tying all this new equipment into an integrated combat system. Successor is likely to become a big player on the market at that time.

But presently, Successor is already scheduled to be put into service with South Korean KDX-2 class ships. Three are expected to be built, the first to be commissioned in 2000. The building of another three is already being discussed. There is also talk of the British Duke class Type 23 frigates being equipped with Successor.

Along with the Vanguard, Trafalgar and Swiftsure class ships implementing SMCS, three Astute class ships also are expected to integrate SMCS. The first Astute class ship is scheduled to be in service in 2006. Therefore, the first SMCS system will most likely be implemented in 2005.

It is probable that the SMCS/Successor systems will be used in many of the above situations. But even more encouraging is that BAeSEMA has been able to open up the SMCS's 1980s-designed Successor naval command systems architecture to COTS software and hardware, particularly on the display and graphics side. Because of this, BAeSEMA has been looking to market SMCS to Australia and other Asia Pacific countries. This could produce a major market potential that could put SMCS/Successor in the global realm.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level			Good Confidence Level				Speculative			
Designation	Application	thru 97	98	99	00	01	02	03	04	05	06	07	Total 98-07
SMCS	SSBN/SSN (UKRN)	16	1	1	1	1	1	1	1	1	1	0	9
SMCS/SUCCESSOR	SSK/SURFACE SHIPS (EXPORT)	0	1	1	3	3	3	0	0	0	0	0	11
Total Production		16	2	2	4	4	4	1	1	1	1	0	20