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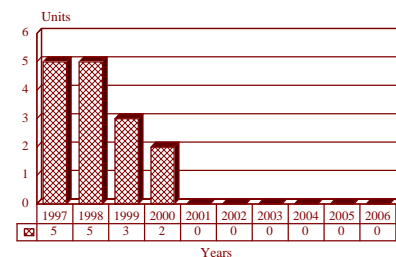
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Outfit DNA - Archived 11/98

Outlook

- A very advanced naval command system
- Software being delivered for operational warships (UK, Korea)
- First export orders won in Korea's Okpo/KDX class
- Others being drummed up in Asia-Pacific region
- Closely related to SUCCESSOR, SMCS

10 Year Unit Production Forecast
1997-2006



Orientation

Description. Integrated naval command, control and combat direction system using distributed architecture and 12 operator workstations tasked with controlling ASW and AAW operations.

Sponsor

Contracts Branch CB/SW32
Procurement Executive
Ministry of Defence
Portsmouth
Portsmouth, Hampshire P06 4AB
United Kingdom
Tel: +44 1705 379411

Contractors

BAeSEMA Ltd
Biwater House
Portsmouth Road
Esher, Surrey KT10 9SJ
United Kingdom
Tel: +44 1372 466660
Fax: +44 1372 466566
(prime contractor and overall systems authority; bulk of the software)

Racal-Thorn Defence Systems Limited

Davis Road
Chessington, Surrey KT9 1TB
United Kingdom
Tel: +44 181 397 5281
Telex:28748
(consoles and video distribution system)

Ultra Systems Ltd

419 Bridgeport Road
Greenford Industrial Estate
Greenford, Middlesex UB6 8UA
UK
Tel: +44 181 578 0081
(main processing electronics and the fiber optics LAN)

Intel Corporation UK Limited

Pipers Way
Swindon, Wiltshire
United Kingdom

Licensees. Negotiations for a Korean licensee to produce equipment for the Okpo/KDX Class frigate program have been concluded, but no details are available at time of publication.

Status. Production and service.

Total Produced. It is estimated that about 18 systems had been built by the end of 1996.

Application. Coordinating the activities in Anti-Air, Anti-Surface and Electronic Warfare (AAW/SUW/EW) operations aboard Type 23 and Okpo/KDX class frigates. Anti-Submarine Warfare (ASW) is included in the frigates as well.

Price Range. The 1992 British Statement on the Defence Estimates confirmed that the contract of that time

covered 12 systems at a total cost of US\$225 million. This gives a unit cost of US\$18.75 million, although it probably includes part of development funding as well. The contract with the Korean navy for the supply of SSCS Mk.7 command systems indicates a unit cost of approximately US\$24 million for the first system, while the follow-on systems for subsequent ships is stated at around US\$12 million.

Technical Data

Design Features. SSCS 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 used at present. Dual input/output nodes link SSCS to the sensors and weapons. The i/o nodes provide the interface for the raw data generated by the ships sensor systems. Local data storage and processing are distributed throughout the system. A typical SSCS processing configuration incorporates some 280 32-bit processors. BAeSEMA have 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.

SSCS 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.

The development of SSCS Ada software requires the dedication of some 500 man-years of effort. Experience has shown that a team of approximately 150 is about the maximum practical for any one complex software project. A particularly challenging aspect of the software development program is the fact that Ada tools were best suited to small or highly centralized systems and its communications facilities require enhancement if full advantage is to be taken of SSCS capabilities. This requires the optimization of new software development tools which take time to mature. In addition to this effort on the software side, BAeSEMA has also formed specialist hardware teams to engineer the system.

Variants/Upgrades

Outfit DNA(1) In the UK service, the variant of the SSCS (surface ship command system) intended for the Type 23 frigates is designated DNA(1). This is the full twelve-screen version.

SMCS (submarine command system) is an action information system which will equip at least eight British submarines of the Vanguard and Upholder classes. This is based on the same SUCCESSOR system as SSCS and Outfit DNA. Both this and SUCCESSOR are discussed in more detail under a separate report.

SSCS Mk.7 Version of SSCS for the Korean Okpo/KDX-2 Class frigates. This variant has eight multifunction consoles for the command team and two consoles for weapons control. The command team consoles will be configured for various tactical functions such as ASW, AAW, ASuW and aircraft control as well as for the fire control of dedicated weapons. All screens are instantly reconfigurable and interchangeable. SSCS

Mk.7 incorporates encyclopedic data with large libraries covering a wide range of platforms and weapons for both manual and automatic classification of targets. An extensive on-board training capability will considerably reduce the need for dedicated on-shore training facilities.

The major differences between the UK and Korean systems will be the interfaces which are adapted to cater for different weapons, although the underlying application software is fundamentally unchanged. Although never confirmed by any sources, it is reasonable to assume that any provision in the British version associated with nuclear weapons delivery has been deleted from the Korean version. There is considerable similarity between the systems, with software changes being restricted to those associated with specific weapons.

SUCCESSOR is an export-oriented command control system intended for submarines and surface ships. Its technology provided the basis from which SSCS and SMCS were developed. Both this and SMCS are discussed in more detail under a separate report.

Additional versions of the basic SSCS system are being developed as potential solutions to the UK requirement for command systems to equip the new LPD(R) amphibious warfare ships.

Program Review

Background. The original CACS-4 was intended for Type 23 ASW frigates and a class of fleet auxiliary. The UK originally planned to fit Type 23 frigates with an upgraded Ferranti Computer Systems CACS (Command And Control System) based on systems already selected and operational in Type 22 frigates. A combination of changing requirements and an inappropriately early technology freeze caused growing concern, and it was decided to abandon CACS4. The CACS4 system did not fail, but was overtaken by operational and technical developments. The costs incurred with the CACS4 program were associated only with the procurement of hardware, most of which has now been redeployed into the other CACS systems.

The development of a new system was forecast as requiring a definition phase of about 12 months, followed by a detailed development phase pushing final production beyond the service entry date for Type 23. Three consortia, led by Plessey Naval Systems, Ferranti and BAeSEMA, responded to the MoD's April 15, 1987, deadline.

On August 12, 1987, the UK MoD announced the award of 15-month Project Definition Study contracts for the development of a new solution. Two consortia, consisting of Ferranti Computer Systems with Logica and Systems Designers, and Plessey Naval Systems with Software Sciences Ltd, were each to receive a contract valued at about US\$4 million, subject to satisfactory negotiation. In November 1987, Plessey announced that it had pulled out of the competition and would not be taking further part in the program as a consortium leader. It cited the terms imposed by the MoD, calling for a demonstrator system within a fairly tight (15-month) time-frame. The Ministry then rebid the contract, following which the BAeSEMA consortium was awarded a PD contract.

The drawn-out procurement program culminated with the award of a £150 million development and production contract to the BAeSEMA consortium. This contract was on a fixed-price basis and placed strong incentives on the company to deliver the command system to the agreed standard, on time, to budget and to the required level of serviceability. In September 1987, the UK's Controller of the Navy confirmed the Navy

was planning to build up to 20 ships of the Type 23 design. Later, this was reduced to 16.

By July 1991, the program was proceeding satisfactorily with the appropriate deadlines being met, although some of the internal waypoints have had to be re-organized due to minor holdups in software development. Such occurrences are inevitable and expected in any large software-intensive development program and project management has been able to accommodate them.

In 1992, UK Royal Navy sources suggested that some elements of Outfit DNA(1) hardware would be installed in *HMS Montrose* in late 1993. Subsequently, the schedule was brought forward to *HMS Monmouth* (early 1993). Additional hardware elements were installed in *HMS Monmouth*, and some of this equipment was back-fitted to *HMS Iron Duke* (commissioned late 1992). This suggests that the hardware side of the program, at least, is proceeding in a highly satisfactory manner. The software side of development was running a little late at this time due to the system running too slowly. This was a developmental problem that was rectified after some effort.

In May 1993, the UK MoD placed an additional contract for five Outfit DNA systems with BAeSEMA. This order meant that all 13 Type 23 frigates currently under construction or in service would receive Outfit DNA, either as original equipment or as a retrofit. At the same time, it was unofficially revealed that the final Type 23 build program was for 18 ships (an increase of two). This appears to be unaffected by the 1993 Defence White Paper, which revealed that the UK Royal Navy frigate/destroyer strength was to be cut by five hulls to around 35 ships. This was to be achieved by the transfer of four Type 22 Batch 1 ships to the training squadron and by decommissioning the two Type 42 destroyers in poorest material condition. Two additional Type 42 destroyers (the remaining Type 42 Batch 1 ships) would be withdrawn from service when the last two Type 23 frigates commissioned.

In July 1993, the BAeSEMA system had won the competition for the command system of the Korean Okpo/KDX frigate saga by 14 out of 15 criteria. In spite

of having the unreserved support of the Korean navy operations branch and technical branch, the Korean foreign office, and the Korean treasury, the largely army-controlled defense council voted to purchase the rival COSYS system. Eventually, after much political confusion in Korea, the decision was reversed and, in May 1994, BAeSEMA was awarded a US\$54 million contract to supply the command systems, sensors and other vital electronic components for the first KDX class frigate. Further contracts will be placed with BAeSEMA for the remainder of the class, two more systems being ordered in late 1994, but these cover only the supply of command systems, with the other electronics being obtained directly from the manufacturer.

Just before the Korean order was announced, *HMS Westminster* commissioned with the first full set of Outfit DNA(1) hardware and a representative set of software on board. Forecast International was privileged to receive an exclusive invitation to attend the commissioning ceremony and spend some time at sea on the new frigate observing a demonstration of the equipment. The first set of operational Outfit DNA software was installed the following August and used to validate the interfaces between the various ship systems.

Additional phased software releases will enhance the basic capabilities of the ship and add new operational dimensions, with the last of the five being installed by 1997. In late 1994, *HMS Montrose* returned to service after being back-fitted with a complete set of Outfit DNA hardware.

Plans to include the Outfit DNA system in the equipment suite of the two AORs were abandoned in early 1994. As we projected, the reduction of the combat capability of the ships rendered a sophisticated computer command facility unnecessary. The equipment being built for these ships was redeployed into the Type 23 program.

A series of Ministry of Defence statements during 1995 revealed the full extent of the problems experienced with Outfit DNA development. As previously surmised, these related to the overall speed of the system which was initially substantially slower than expected. As a result the tactical picture presented by the command system fell behind that developing in reality. These problems had already been addressed and solutions determined by the time that the parliamentary statements were made. Overall, the total program delays involved in Outfit DNA development and production do not exceed 22 months.

Funding

BAeSEMA Limited has produced SMCS in response to a UK Ministry of Defence contract covering the Type 23 command system awarded in 1984 and valued at £85 million. Final development and initial production is covered under a contract awarded to BAeSEMA in August 1989.

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.

Recent Contracts

Contractor	Award (\$ millions)	Date/Description
BAeSEMA	N/A	<i>May 1993</i> – UK MoD contract for five additional Outfit DNA systems
BAeSEMA	54.0	<i>May 1994</i> – Korean contract for the supply of a complete SSCS Mk.7 command system for the KDX class frigates (presently known as the Okpo class)
BAeSEMA	30.4	<i>Jan 1995</i> – Korean contract for two SSCS Mk.7 command systems for the second and third batch KDX class frigates (KDX-2 and its successor)

Timetable

	1978	MoD selected CACS 4 for Type 23 development
	1983	Ferranti began development of CS500 family
	1984	Type 23 frigate <i>HMS Norfolk</i> ordered
	1985	MoD awarded CACS-4 contract
	1986	<i>HMS Fort Victoria</i> ordered
	1986	Three more Type 23 frigates ordered
	1986	MoD summoned 19 companies to presentation
	1987	UK issued RFP for CACS 4 replacement
	1987	Ferranti launched CS500 family of naval systems
	1987	Type 23 frigate <i>HMS Norfolk</i> launched
	1987	MoD canceled CACS 4 program
	1987	MoD awarded competitive PD contracts
	1988	2nd Batch Type 23 frigates ordered (3)
Aug	1989	BAeSEMA selected as supplier of Type 23CS
Dec	1989	3rd Batch (3) Type 23 frigates ordered
	1990	Type 23 frigate <i>HMS Norfolk</i> commissioned
	1991	Type 23CS designated Outfit DNA(1)
Dec	1992	First shipboard SSCS hardware delivered
Apr	1993	Both AORs commissioned
May	1993	Second order for Outfit DNA systems
Apr	1994	First complete SSCS hardware delivered
May	1994	South Korean contract awarded
	1996	Final configuration for SSCS
Oct	1996	Trials of Phase 3 software package completed
May	1997	Demonstrations of Outfit DNA (1) to South Korea, Singapore navies
Jul	1997	Demonstrations at Defense Industry Days in Fremantle, Australia
	1997	Sea trials scheduled to begin with Outfit DNA (1)

Worldwide Distribution

South Korea (3+ potentially 6-7 on KDX frigates and for shore training)

UK (2+14 Outfit DNA(1) on Type 23 frigates, 2-4 shore training stations)

Forecast Rationale

Winning the Korean order means that the future of Outfit DNA is no longer linked to actual or potential orders for the domestic Type 23 frigates. The Korean KDX program is, from the BAeSEMA point of view, working well. According to Korean industrial sources, SSCS will be installed on all the KDX-2 frigates, while an advanced version of the system will be used on the third batch of that same series. Provided the necessary export clearances can be obtained, these Korean naval industry sources expect that the Batch III ships will have SSCS acting as a command system for the AEGIS air warfare combat direction system. Combined with the reportedly exceptional success of the closely related SMCS system during its trials on the submarine *HMS*

Vanguard, a series of major technical and professional milestones have been passed.

BAeSEMA is also using SSCS technology as the basis for its bid to provide the command systems for the UK Royal Navy LPD(R) program. At first sight, the capabilities of SSCS – even in a much simplified form – greatly exceed those required for amphibious warfare ships. However, if the amphibious warfare ships are to assume a command role in intervention or peacekeeping operations, a substantial C³I capability may be essential.

With the Type 23 command system problem resolved, the first systems were delivered in 1995 for initial operating service in 1996. Trials of the Phase 3 software

package were completed on October 18, 1996, and BAeSEMA is actively promoting the system in the Asia-Pacific region in particular in 1997. Demonstrations were carried out for the South Korean and Singaporean navies in May, and in July, participation was planned for the Defense Industry Days in Fremantle, Australia. The market is hoped to open in that region in particular, since most European navies are cash-strapped and have their hands tied for many years to come in procurement plans.

SSCS is likely to be retrofitted to any ships that have entered service without definitive C³I facilities. Following recent British defense cuts, the Navy surface fleet has been stabilized at 36 vessels. Initially, 10 will be Type 22 frigates, 16 Type 23 frigates, and 10 Type 42 destroyers. Eventually, the eight remaining Type 42 destroyers will be replaced by 12 Project Horizon air defense ships, and four Type 22 Batch 2 frigates transferred to the training squadron. The Type 23 frigates are forecast as receiving Outfit DNA.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION													
Designation	Application	thru 96	<u>High Confidence</u>				<u>Good Confidence</u>				<u>Speculative</u>		Total
			97	98	99	00	01	02	03	04	05	06	
OUTFIT DNA	FFG (UKRN)	12	4	4	2	2	0	0	0	0	0	0	12
OUTFIT DNA	Prior Prod'n:	3	0	0	0	0	0	0	0	0	0	0	0
SSCS MK.7	FFG (KOREAN NAVY)	3	1	1	1	0	0	0	0	0	0	0	3
Total Production		18	5	5	3	2	0	0	0	0	0	0	15