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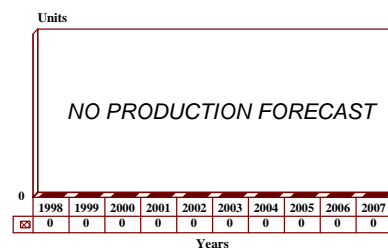
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BATES - Archived 1/99

Outlook

- Entered British Army service in 1992, seven years behind schedule
- Unit due to be replaced by the Light Artillery Computer System (LACS) in 1997-1998
- 29th Commando Regiment was due to receive the last of the BATES systems in 1997-1997, but may instead be equipped with LACS.
- Unless additional procurement is confirmed, this report will be dropped in 1999

10 Year Unit Production Forecast
1998-2007



Orientation

Description. The Battlefield Artillery Target Engagement System (BATES) is an acquisition, data transmission and fire control system providing a semiautomatic data processing system for artillery target location, discrimination, engagement and fire coordination.

Sponsor

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Contractors

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Licensee. No production licenses have been granted.

Status. Production and in service.

Total Produced. As of 1997 approximately 315 BATES systems have been procured.

Application. BATES is designed to centralize the command of artillery with all calls for fire being passed automatically to the highest level or delegated to the battle area. In theory BATES will permit the command of full Corps artillery by a single cell with all fire requests routed through it.

The command structure is flexible and easily modified to suit changing battle conditions. Artillery intelligence is fully integrated and exploited, while commanders and their staff are relieved of logistic and routine tasks.

Price Range. A single BATES system costs approximately US\$350,000 per unit (1992 dollars).

Technical Data

Characteristics

<i>Protocol:</i>	CMOS
<i>Processor:</i>	3 pairs Intel 8086/8087
<i>Internal memory:</i>	1.676 MB
<i>Mass memory:</i>	30 MB
<i>Power supply:</i>	24 Volts DC
<i>Communications interface:</i>	Full duplex RS422

Design Features. BATES has adopted the philosophy of utilizing distributed data processing at all artillery command centers, with access to the system provided for outlying stations (such as forward observers) by way of digital entry devices. Digital displays are provided at each gun or rocket launcher. The allotment and tasking of the most suitable fire elements is automated, as is the selection of the type and quantity of ammunition required, and the ammunition stockpile update. The system can support up to 16 guns at each battery location with ballistic calculations being carried out for each gun. The number of potential targets stored is effectively unlimited.

A small number of interchangeable hardware elements is combined to form three cell types. The Processing Cell is deployed at artillery command centers. The heart of this unit is a computer with 17 MB of storage and capable of driving up to 14 external devices. The Minor Access Cell is mainly used by forward observers, but also provides access to the system for other users such as roving commanders. It is comprised of a Data Entry Device with a standard typewriter keyboard and interfaces to radio, wire, laser rangefinders and other devices. Display Cells are located at individual towed or self-propelled guns to store and display fire orders and allow two-way exchange of status and ammunition information. Each type of cell can act as a back-up to other cells and is fully interchangeable by reloading software.

Communications are by digital links over the Ptarmigan combat net radio, wire and area communications system with built-in error detection and correction. There is capacity for an unlimited number of cells in any combination of net configurations with unique addressing

and automatic routing of calls throughout the system. Computer assistance in selecting the most appropriate links is available. Facilities are provided for a large number of pre-formatted messages in order to allow transmission of information in a highly structured, abbreviated form for efficient net utilization, ease of validation and processing. Provision can be made for mixed data and voice if required, and alternative transmission modes and speeds can be matched to radio conditions.

The BATES computer utilizes CMOS technology with three Intel 8086/8087 processor pairs. Internal memory consists of 1.676 MB static RAM and 224 KB ROM. Fourteen RS422 serial interface ports are provided to support radio networks and peripherals. A back-up internal battery maintains volatile memory in the event of power disruption. Mass memory is provided by two 15 MB removable ruggedized Winchester cartridges. The VDUs are intelligent units with their own primary power supplies. A plasma panel, flat screen display having 36 lines of 73 characters presents user information. Each uses an Intel 8086/8087 processor pair and has an internal memory of 196 KB static RAM and 96 KB ROM.

The Data Entry Device is an intelligent peripheral equipped with a plasma panel flat screen display providing 10 lines of 36 characters. The unit has an Intel 80286 processor with 64 KB RAM and 224 KB reprogrammable ROM and an Intel 8031 processor with 2 KB RAM and 16 KB ROM. A full duplex RS422 communications interface and an auxiliary RS422 peripheral interface are included.

Variants/Upgrades

No variants and/or upgrades are known to exist. It is doubtful that a variant and/or upgrade will be produced due to the Light Artillery Computer System (LACS)

becoming available in late 1997/early 1998. The LACS has been acknowledged as the replacement to BATES.

Program Review

Background. BATES had been developed to replace the British Army's existing Field Artillery Computer Equipment (FACE). Production of FACE was concluded after it had been delivered to 18 countries. The project definition and feasibility study which resulted in the BATES development was started in 1976 and took four years to complete. Full-scale development started in 1980 with an intended entry-to-service date of 1985. Development was originally conducted under a cost-plus contract which resulted in parliamentary criticism when the program ran into delays and technical difficulties. The Phase 2 contract, covering some two thirds of the required equipment, was performed on a fixed-price incentive basis.

According to the June 1988 House of Commons Select Committee on Defence 5th Report on the Procurement of Major Defence Equipment the BATES program suffered serious slippage with the contracts having to be renegotiated. The Committee concluded that the MoD and the contractor had seriously underestimated the software challenge presented by the project and that the combination of technical task, cost-plus contracting, and the absence of a prime contractor placed the MoD at much risk. The MoD conceded that the original software specifications lacked precision.

At the time of BATES' conception, it had been thought that tight specifications for software intensive projects could not be written in advance of actual development work. MoD finally agreed that this was not so. Reports indicated that the BATES computer equipment had suffered from a large number of software bugs which, although not individually serious, together placed very severe restrictions on the usability of BATES. In addition, the computer mainframe itself reputedly suffered from overloading and overheating. Marconi denied any problems claiming that the software and hardware problems afflicting the system had been ironed out, and that the system was ready for full-scale production when the necessary contracts were awarded.

In 1987 -1988 a political crisis occurred with the BATES system when GEC was investigated for seriously overcharging the UK MoD contracts. One of these systems was BATES, and it was later learned that over 40 percent of the BATES R&D staff, representing the brightest scientists, left the project. This forced a skeleton crew that simply floundered for two years while seeking solutions to the software bugs.

In January 1990, initial interoperability trials were carried out between BATES and the German equivalent, Adler. Both encrypted and in-clear traffic was successfully passed between the two systems, but the Adler clock system will have to be changed to match that of BATES, which is of the accurate-crystal type. By the end of 1990, BATES also underwent interoperability trials with the US Army AFATDS system.

The British 1991 Defence Estimates revealed that a single regiment of the British Army was equipped with BATES on a battery level in late 1990/early 1991. This equipment was not deployed to the Persian Gulf and, therefore, did not take part in Operation Desert Shield/Desert Storm. This scale of issue was extended to Regimental level in July 1992 when the 4th Field Regiment, Royal Artillery was declared operational with the new system. According to the UK MoD, additional regiments were to be equipped with BATES in the future and equipment on the Divisional level would commence during 1993. BATES is currently in service in vehicles such as the GKN Defence Warrior and FV432 used by the Royal Artillery.

In accordance with the above schedule, the UK Ministry of Defence placed an order for additional production of BATES components in July 1993. This order was valued at US\$90 million and was intended to allow fully automated control of MLRS and AS-90 artillery units from division to corps level. This represents the final phase of the existing BATES program. According to contract details, deliveries of the equipment were to be completed by 1997.

Funding

The Phase I contract, awarded in November 1985 to Marconi Command & Control Systems, was valued at US\$195 million. The House of Commons Committee of Public Accounts indicated that project definition expenditure on BATES had totaled US\$23.4 million by the end of 1986. Known expenditure on the BATES system at that time, attributable to Scicon's program development effort, totaled US\$85 million.

Funding details are available from various Defence White Papers, despite these documents' ambiguous description of individual projects. The 1989 to 1992 Defence White Papers made no reference to BATES expenditure but details re-emerged in the 1993 Defense Estimates.

Recent Contracts

Contractor	Award (US\$ millions)	Date/Description
Unknown	18.6 (Estimated)	Jun 1995 – Tenders let to four companies to install up to 34 BATES units in three different vehicles (Hägglunds Bv 206, Truck Utility Medium (Heavy Duty), and Truck Utility Medium).

Timetable

	1976	System definition started
	1980	Full-scale development started
	1982	Development contract let
Apr	1985	Contract let on incentive basis
	1985	Scheduled in-service date
Nov	1985	Phase I contract awarded to Marconi CCS
Jul	1986	Tender competition for BATES phase II launched
	1989	Phase II delivery originally scheduled
	1990	BATES interoperability trials with the US AFATDS and German Adler
	1991	BATES introduction to service at battery level
	1992	BATES declared operational at Regimental level
	1993	Contract for BATES introduction at division level placed
Sep	1995	Proposals due for UK 29 Commando Regiment, Royal Artillery vehicle installation kits
	1997	Completion of Phase II delivery planned

Worldwide Distribution

Bates is restricted in its use to the **British Army**.

Forecast Rationale

The BATES system, which suffered from a seven-year program delay and cost overruns estimated at over 140 percent, entered service with the British Army in 1992. The vast majority of the problems experienced by the design team was in the BATES software. In retrospect, the commitment of the British Army to the BATES system was premature – the technology and managerial skills available at the time were simply not up to the tasks imposed upon them. In addition, a scandal broke in 1987-1988 involving 57 systems, including BATES, in which GEC was overcharging the MoD by millions of pounds. This led to additional delays as the program was restructured.

The 1992 British defense review, Options For Change, reduced the artillery component of the British Army by about a third. This would imply a proportional reduction in the BATES requirement as well. This is deceptive, however, because the reduction in the number of regiments has been offset by a corresponding increase in the number of guns per regiment (from 24 to 32). Furthermore, although a smaller number of signif-

icantly more powerful units would appear to require a smaller number of command systems, those units are now going to be equipped with significantly longer-range and more powerful weapons (155 mm self-propelled guns in place of 105 mm, and MLRS in place of 203 mm self-propelled guns). Fire-control and target-acquisition demands add to the burdens placed upon the C³I net commanding these weapons, offsetting the savings made elsewhere.

Also in June 1992 the final phase contract was awarded some seven years later than originally planned, and the parallel re-appearance of BATES listings in the Defence Estimates, suggested that the process of completing the BATES network was under way. The British Army initially wanted to field 800 systems, but subsequently dropped this number to 600 in 1988. Due to a number of factors (i.e., its extremely late procurement start, the downsizing of the British Army, and the fielding of a replacement system (LACS)), it is doubtful that BATES will even achieve 400 units.

The last known orders for BATES was a tender in September 1995 for the installation of 34 units on a variety of vehicles (the Hägglunds Vehicle Bv 206, the Truck Utility Medium - Heavy Duty, and the Truck Utility Medium) for the 29th Royal Commando's. Four UK companies responded, Basys Technology, Dytechna, EASAMS and Hunting Engineering, to install a kit form of BATES. If the contract was let, these units were to be delivered in 1996-1997.

However, it is possible that the 29th Commando did not receive these units as the replacement to BATES, designated the Light Artillery Computer System (LACS),

is believed to have been procured starting in 1997. The LACS is a COTS-based system that is lighter and less complex than BATES as well as having an increased memory, and more functions and processing power.

The 10-year forecast shows no orders for BATES through the entire time frame. The last known order, if delivered, occurred in 1996 or 1997. BATES is most likely being replaced by the LACS system.

Since the initial 1992 order, it is believed that approximately 349 systems have been procured through 1997, representing nine regimental batteries plus spares.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION													
Designation	Application	thru 97	<u>High Confidence Level</u>				<u>Good Confidence Level</u>				<u>Speculative</u>		Total
			98	99	00	01	02	03	04	05	06	07	
BATES	Prior Prod'n :	349	0	0	0	0	0	0	0	0	0	0	0

***** Unless orders of additional BATES systems are confirmed, this report will be dropped in 1999. *****