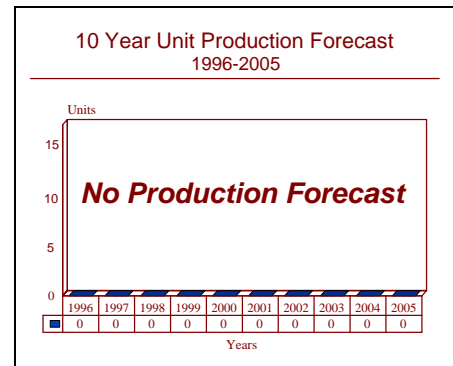


Wavell - Archived 10/97

Outlook

- Desert Interim System probably pilot for Wavell-2
- System upgrade likely to be high priority in near future



Orientation

Description. A common-user automatic data processing system assisting commanders and their staffs with the conduct of general operations and intelligence analysis at corps, division, and brigade levels by automating data handling and control.

Sponsor

Directorate of Command, Control, Communications and Information Systems, British Army.

Contractors

Siemens-Plessey Defense Systems

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Somerford
Christchurch
Dorset BH23 4JE
United Kingdom
Tel: +44 1202 486344
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GEC Computers

Elstree Way
Borehamwood
Hertfordshire WD6 1RX
United Kingdom
Tel: +44 181 953 2030
Telex: 22777

Licensee. No production licenses have been granted.

Status. Production and service.

Total Produced. Single integrated system.

Application. Wavell provides a common-user system to which all tactical command cells have access via the Pfarmigan area communications network. Automatic data processing (ADP) is employed to assist in the conduct of general operations and intelligence work. The data used by Wavell is a distillation of the detailed activities of the specialized arms and services. This makes essential the coordination of several advanced ADP systems variously dedicated to communications, fire control, air operations and engineering activities.

Price Range. Based on analysis of contract values, a single Wavell station costs between US\$ 1.1 million and 1.5 million.

Technical Data

Design Features. Wavell is designed to use any suitable communications link. It is able to operate with BATES (Battlefield Artillery Target Engagement System), the semi-automatic data processing and the fire-control system developed for the British Army by Marconi Space and Defence Systems. Wavell Stage I used data links provided on the British Army's Bruin trunk communications network. Wavell Stage II entered service in 1985 and uses the Ptarmigan tactical trunk network.

Data processing facilities at each headquarters include a central processor, bubble memory back-up storage and floppy disk drives for loading programs and data. These are located in a Wavell dedicated vehicle and are linked to the communications system, to the remotely located video display terminals and to hard copy printers. At corps and division levels, the system will be installed in a standard 1-tonne container mounted on a Bedford 4-tonne flatbed prime mover. A 20-kW generator provides power for the air conditioning and lighting system and, through a power conditioning unit, for a 28-Volt DC source for the ADP system and back-up batteries. The Automated Data Processing (ADP) system is installed in a rack based on the Air Transportable Racking (ATR) system. A similar installation is provided for use at brigade headquarters, but this is mounted in an FV-430 series armored vehicle with power and air conditioning equipment mounted on the roof.

The ADP facilities are the heart of the system in both installations. The rack accommodates the central processor unit and associated fast storage in three full-ATR units. Up to 1 megabyte of semiconductor memory

is provided in this configuration. Next to the processor is the interface unit for the communications and terminals, which are driven at distances of up to 1 km by balanced line drivers accommodated in two half-ATR units, each capable of driving 16 channels. The necessary controls and warning lights are located along the top of the rack together with two floppy diskette drive units used for loading programs and data.

The bottom row of the rack accommodates up to three bubble memory back-up storage units, each with a 24-MB capacity. The bubble memory offers a number of advantages over the disk including low-volume and low-power dissipation. In addition, memory is not lost when power supplies are interrupted, yet can be easily and quickly erased when required. The data base capacity of the system is approximately 72 MB. Advances in bubble-memory technology are expected to increase that capacity by a factor of four.

Existing data can be entered into the system prior to deployment. Once in operation, newly acquired raw data can be added and collated with the existing information and with further data generated by the system. The collated and analyzed data subsets can then be formatted and presented on staff video display terminals. These formats can be used by the staff to assist with formulating plans and orders, and in the preparation of briefs for higher command. General-purpose free-text facilities also are provided for messages and orders. All formats can be printed out on a hard-copy printer for briefing or fall-back purposes, and for staff cells not equipped for Wavell.

Variants/Upgrades

The present emphasis of activity lies in curing teething problems and ensuring that all the current British C³I programs are compatible. Further into the future, the DCIS is tasked to achieve unified development of all future battlefield systems under the General Purpose CIS program (GENECIS).

System Level Modification C introduced packet switched network interrogator forms and network monitors. Major

software changes were instituted and disk drives introduced to replace the bubble memories.

Desert Interim System. The Desert Interim System (DIS) is a modernized derivative of Wavell used to support British operations undertaken during the Desert Storm. It uses more advanced computer and data handling technology than Wavell and is structurally modified to accommodate the unusually high level of support troops in the British formation.

Program Review

Background. Project Wavell began in the early 1970s as a study of staff functions in the field aimed at identifying time consuming tasks open to automation. Detailed information was accumulated, but the British Army was not clear on how to proceed further, due to senior officers' skepticism of using computers for command and control.

A decision was made in 1976 to field a limited system that would use commercial equipment with minimum ruggedization and from which staff reaction could be obtained. For this trial phase, it was decided not to attempt automatic signal message handling in headquarters, to provide ADP only for operations and intelligence functions, and to base the system on existing staff procedures. A £6 million contract for this trial was awarded to Plessey Defense Systems.

Stage I handling equipment was fielded in 1978 with the 2nd Armored Division in the Hanover area. The system was designed to collect, collate, evaluate, and disseminate information, providing commanders with an overall picture of the state of one's own forces, information about one's own and enemy forces available to supporting arms, process information from electronic warfare and other intelligence agencies, and build up a picture of enemy deployment and strengths. As the trial phase proceeded, the system's success resulted in its extension beyond this original concept to become widely used by artillery, engineers, and logistics.

The UK Ministry of Defence authorized Stage II production in October 1979. It was planned to introduce the system to the entire British First Corps stationed in Germany during the early 1980s. In 1983, a production contract worth US\$37 million was placed with Plessey Defence Systems for the production of 33 Wavell systems. Sixteen of these systems were to be installed on wheeled vehicles and 16 on tracked vehicles.

Full operation was expected in 1985. Delivery of the systems started in that year and was completed by 1987. Stage I trials undertaken between 1978 and 1984 validated the basic concepts of distributed data base management across a volatile and changing communications network. The expansion of the system to corps-wide operation showed how much remained to be learned in operating a system exploiting the front edge of technology. Problems were experienced with reaction times in excess of those targeted and also with human factors. The former were solved by the introduction of improved equipment and the latter by better personnel selection and training.

All three divisions forming the British First Corps in Germany received their allocation of Ptermigan/Wavell

hardware by the end of 1987. The first of a number of exercises (Flying Falcon), designed to extensively test the equipment in an operational-like environment, took place in January and February 1988. The results were disturbing. Although the hardware system was adequate, the software side of Wavell was dogged with problems. The floppy disks used proved vulnerable to corruption in field conditions. This led to a complete loss of confidence in the system with users reverting to manual data collection. A Plessey Ptermigan/Wavell support team took part in the exercise in order to determine the scale of the problem and find solutions.

A repeat exercise, Flying Falcon 89, demonstrated a number of improvements in key areas of the Wavell system. A software upgrade which included better housekeeping facilities, was also introduced. Revised operational procedures included the more frequent dumping of redundant data. This accelerated response times in Wavell which then needed between 20 to 30 minutes to produce the requested data under certain circumstances. An enhancement to the processing power of the system was addressed in part by Edition 5 of the Wavell Operational Software which was released by the end of 1990. Also envisaged at that time was a basic revision of the Wavell hardware to provide increased processing power and to move away from the troublesome bubble memory.

The 1st (British) Armored Division deployed to Saudi Arabia took its Wavell ADP system with it and the system was extensively used during the Desert Storm. The resulting experience is reported to have been mixed. There can be no doubt that the system marked a revolution in military technology and profoundly influenced the command control aspects of the operation. The equipment performed far better than previously had been experienced. However, it was still considered to be too slow and unresponsive, and data input took too long, with the result that when operations reached a critical tempo Wavell fell behind the flow of events, and the command control reverted to manual procedures. A significant part of the problem was considered to be procedural, with personnel trying to use computers to speed up tasks optimized for manual handling, rather than exploiting the specific advantages of automated systems.

As a result of the experience gained during the military build-up in Saudi Arabia, the British Army introduced the Desert Interim System (DIS) which used the existing Wavell equipment as a basis for a more modern and effective tactical data handling network. This also modified the basic Wavell structure to accommodate the

peculiar structure of the British 1st Armored Division. As a result of the British perception that maintaining supply would be a major tactical determining step, this unit was basically a small division (two brigades) with the logistics, engineering and support structures of a complete corps. DIS required significant modification to fully reflect this.

The continued lack of mention of Wavell in the 1995 UK Ministry of Defence Statement on the Defence Estimates indicates that the expenditure on Wavell procurement is now virtually complete and that the final elements of the program remain on track. This project is no longer carried as a line item within British defense expenditure budgets. Future expenditure is expected to concentrate on upgrades and fault rectification. To some extent, these operations were carried out on an emergency basis during and immediately after the Desert Storm and were funded under

that heading. This additional funding will be deducted from that allocated for future years, so that the overall effect of the DIS development may be to reduce short- and medium-term expenditure.

The British participation in peacekeeping efforts in Bosnia has resulted in further operational testing of the basic Wavell concept. Here, the equipment is being used in a small tactical unit (a reinforced battalion) in an extraordinarily complex situation. The command control load is made more onerous by the very exacting rules of engagement laid down by the United Nations. These specify that defensive action can only be taken against individual guns or vehicles firing on UN troops. Wavell is used to track and direct attacks on such units. It has done so successfully, inasmuch as any system could accommodate such unrealistic requirements.

Funding

By 1987, Wavell related contracts worth over £80 million had been placed with Plessey. Of this, £45 million related to Stage II equipment. It should be noted, however, that there is a major difference in the administration of development and production contracts between the UK and the United States. 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. This fund may have received an unanticipated drain as a result of DIS development.

Recent Contracts

Contractor	Award (\$ millions)	Date/Description
Plessey Defense Sys.	9.0	1976 - MoD Stage I Wavell contract for 6 Systems.
Plessey Defense Sys.	40.0	Oct 1979 - MoD Stage II Wavell contract for 33 systems.

Timetable

	1970-73	Initial feasibility study.
	1976	Limited system fielded.
	1978	Stage 1 equipment fielded.
Oct	1979	Stage II production approval.
	1981	BATES/Wavell interoperability contract.
Nov	1983	Stage II production order placed.
	1984	Rationalization of British Army ADP decided.
	1985	Unified ADP development structure formed.
	1985	Initial stage II entry to service.
Feb	1987	Deliveries of Stage II vehicles completed.
	1989	Interoperability with France/US/Germany achieved.
	1990	System C modifications and software edition 5 introduced.
Jan	1991	Wavell combat debut. (Desert Storm)

Worldwide Distribution

Wavell is deployed only with the **British Army**. It has not been exported.

Forecast Rationale

The Desert Interim System represents the first stage of a complete modernization and redesign of the Wavell system. The experience gained with the DIS is being combined with the analysis of the results of the Desert Storm to produce a second-generation Wavell, probably to be described as an upgrade but in reality representing a new system, possibly named "Wavell-2". This will not be DIS as such, which was heavily optimized toward the requirements of the British First Armored Division, but will use some of the technology experimentally deployed with DIS. The new system architecture will be differently structured from Wavell and will make use of computer technology available since the original system was designed.

It is to be noted that the performance of the Wavell system has improved quite independently of the get-well programs, as a new generation of soldiers has arrived in the British Army. Having grown up in an environment where computers are an accepted and familiar part of life, they brought with them a sophisticated understanding of computer equipment and its capabilities. They do not, for example, fold 5.25-in. floppy disks in half to put them in battledress pockets — a major cause of data loss problems earlier in Wavell's history. Another cause of problems is the fact that Wavell has been designed to perform tasks in a manner originally intended for manual techniques. These routes are not computer-optimized and are, therefore, performed inefficiently by the computer systems. These concerns will be addressed with the new system.

Following the collapse of the Soviet Union, much debate has centered on the role of NATO in the new European environment. A Rapid Reaction Corps (RRC) has been created, to provide the nucleus of a peacekeeping and out-of-area intervention force. This Corps is effectively British-commanded, but military personnel are drawn from many NATO countries. These national contingents are bringing their own command systems and procedures with them, causing serious interoperability constraints.

The integration side of the Wavell upgrade development program, specifically the interfacing of the current German HEROS, French SACRA and US MCS command and control systems, will become a high-priority task.

Experience in Bosnia, on the other hand, points to a different set of requirements. If exceptionally restrictive rules of engagement are to become the norm rather than the exception, command systems and battlefield data analysis will have an entirely disproportionate load placed upon them — in effect tracking individual enemy vehicles and personnel rather than small units of same. This would require very large increases in computer processing power and memory capacity.

As we predicted in 1994, '95 was an uneventful year for Wavell. Procurement of the current production configuration was virtually completed in 1994 and no technical or program difficulties have been reported. Unfortunately, the design of Wavell is based on 1970s' technology which has caused us to zero out further procurement in the forecast. Its future is contingent on Wavell being the subject of a major modernization upgrade. The disclosure of the existence of the Desert Interim System (DIS) has confirmed our belief that a new follow-on project to Wavell is in the process of being launched. However, until this actually happens and Wavell reappears in the Ministry of Defence Statement on the Defence Estimates, program funding will remain at zero level in our forecast.

Effectively, DIS is a pilot system for the new program, tentatively designated Wavell-2 by us. As stated above, this could either be called an entirely new system or a major upgrade, as is necessary, to get it past the UK Treasury approval. We have provided a separate funding line for this, since it is likely to be treated as a new development with prime contractorship up for bids. The scale of funding will, we believe, be comparable to Wavell. This work will be mainly oriented to a pan-European system for the new Rapid Reaction Corps.

Ten-Year Outlook

No production forecast.

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