April-June 1981

Computer International

A turn for the better

Contents

rs Thatcher's administration is showing understanding of the inextricable links tween government and industry in ntemporary society. Recent evidence of s was a successful Parliamentary motion aranteeing ICL loan facilities up to 00 million over two years. These cilities do not constitute a grant or bsidy. They simply provide a basis for staining cash hungry operations during world recession.

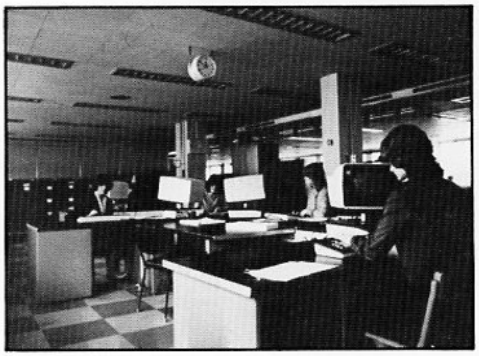
MPs voted on this action after hearing w ICL was 'contributing substantially' to itain's trade balance and had won, bar M, 'the biggest customer base outside nerica and Japan of any computer anufacturer'. The company has 12,000 stomers with 50,000 installations worth er £2 billion.

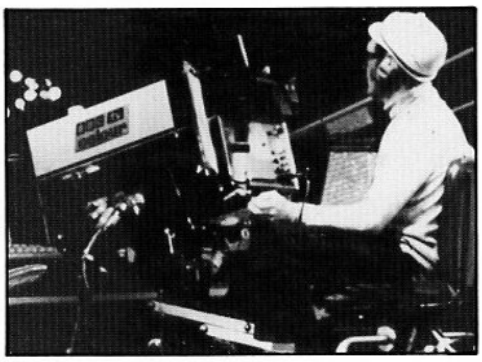
Despite such success ICL has been able to maintain profit levels achieved ring the Seventies. Future prosperity ay well depend on a more selective ploitation of the company's nsiderable expertise. Such plans, serts managing director, Christopher ilson, should ensure full continuity of pply and support for customers (pages 8 d 9).

ICL customers currently enjoy a mpetitive and coherent product range cond to none. Product offerings can tisfy diverse user needs, just a few of nich are chronicled in this magazine.

If you would like more copies of this *omputer International*, or wish to ceive future issues, they can be otained from local ICL sales offices or rect from me at the address below.

Ian J. Armstrong





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'THE PRU' SCORES DOUBLE FIRST

A DOUBLE first was achieved in 1979 when the Prudential Assurance Company Limited chose ICL equipment for an extensive terminal network valued at over £750,000 for its life administration division in Reading, Berkshire. This signalled the Prudential's first on-line computing application for non-development work and involved the first use of ICL equipment as a node in IBM's Systems Network Architecture.

The contract was for over 200 ICL video terminals and four System Ten 220 computers which will provide local computing for clerical staff working on life assurance administration by giving a direct communications link to the Prudential's IBM mainframe in London. The ICL System Tens 'look' like standard IBM terminal cluster control units to the mainframe. Each of the System Tens will be handling up to 50 terminals whilst at the same time talking to the central computer.

Use of this new ICL network will enable the Prudential to streamline its current administration work and continue to improve services to its policy holders and agents.

The Prudential is the largest insurance company outside the US. There are over 12 million policies in its Industrial Branch and four million General Branch policies. In addition there are approximately 2.5 million life policies with the Ordinary Branch, for which this new computer system is designed.

The Prudential sells its policies through nearly 10,000 agents. With this size of selling organisation there are considerable problems with the servicing of new and existing life business in Reading. Some 1,500 staff work there, 900 of whom are concerned with the Ordinary Branch business, and they control the administration of new proposals, premium collection and recording, policy alterations, claims and commission payments.

Computerisation of the Ordinary Branch was begun in 1969 with a batch system giving full details of all policy records on file. This has since been continuously developed. Policy records range from 600 to 3,500 characters of information and the total file on disc runs to 2,400 megabytes. The batch system currently runs on an IBM 370/158 AP (Attached Processor) in London, with a second available for back-up.

The system has now been completely revised for database and on-line working. Previously, whenever staff wanted to examine or amend a record it was necessary to fill in a batch requisition form, which was passed from Reading to London for overnight processing. Now, as the ICL network is developed, more and more use will be made of direct, interactive working through terminals in Reading. This will reduce paperwork and give access to policy records in seconds.

Different faces of the Prudential: the company's majestic headquarters in London and (inset and opposite) part of its extensive terminal network for the life administration division in Reading, Berkshire.

enquiry system, which went live in March 1981. When a user in Reading requests details of a policy record they are transmitted from the database on the central computer in London through the communications network to a disc unit on one of the System Tens. From the initial interrogation to the display of a record on the screen takes between five and six seconds. Subsequent pages of the same policy record can be examined with a response time of approximately two seconds.

Development of the enquiry system has been a valuable exercise in introducing on-line computer systems to the staff and has led the way to creating an on-line network which will act as a stepping stone for future applications.

The next major step, in February 1979, introduced the Service History System, which enables the renewal accounts department to monitor cash discrepancies more speedily. With nearly two million premiums being collected every month by direct debit and approximately 250,000 cash payments, there is inevitably an administrative overhead. Previously, discrepancies were listed as batch output on a line printer. With the new system the Prudential is moving towards a genuine electronic office. Via a prompt list, generated in the batch system, any discrepancies detected are automatically drawn to the attention of the clerk responsible for that policy when he next keys into the system. He thus has an automatic reminder of those cases with which he must deal.

For each case the Service History System displays the policy record and that policy. The clerk takes the appropriate action, which he records on the computer terminal. This either clears the case or is retained to act as a further reminder. For example, if he were to write to an agent asking for specific action in dealing with a query, the system would automatically remind him after a period of days to re-examine that case unless it had already been satisfactorily cleared.

This is a much more effective way of controlling account discrepancies than any manual method, for it not only prompts the clerks directly but also produces summary reports to advise supervisors of any build-up of outstanding queries.

The first major cost benefits are beginning to be realised with the introduction of the Service History System and it is expected that its use will lead to increased productivity at the Reading office.

By next year it is planned to introduce the third major system to take advantage of the new ICL communications network. This will involve the issue of quotations for policy alterations. Many of the policies written by the Prudential offer the assured an option to convert a policy from, for example, whole life to endowment. Requests for quotations will be keyed in directly through the terminals and a quotation generated for despatch to the policy holder. The eventual aim is to extend this facility so that if the quotation is accepted it will be possible to update the policy records directly. Not only will this lead to greater clerical productivity, it will also mean that the assured receives computer-produced quotations, so giving a better service.

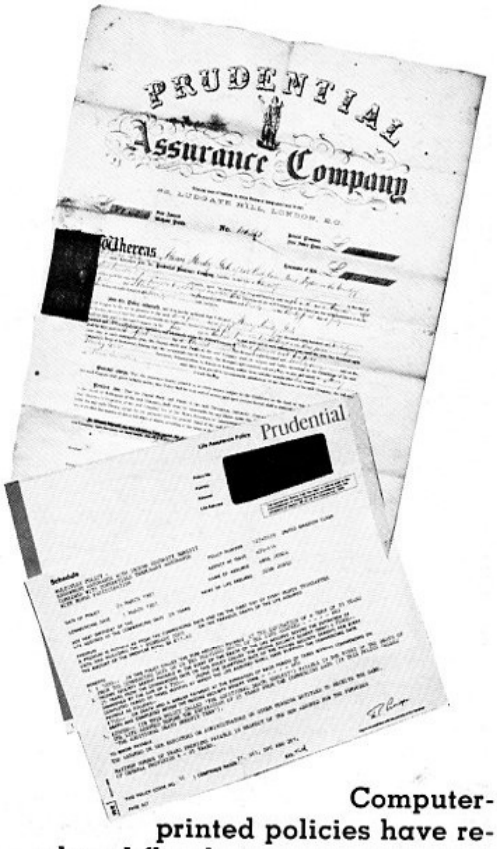
Other applications planned for the network include New Business and Surrender Quotations. The system analysis for the introduction of a proposal system will start this year.

For the major applications the eventual aim is to have one terminal for every two non-supervisory clerical staff. Initial development involved ICL 7561 terminals but the system is now being equipped with ICL's latest Model 85 terminals. The big advantage of the Model 85 is that it occupies appreciably less desk space and has a screen unit which can be swivelled and tilted to allow two users easy access.

According to a Prudential spokesperson, ICL was awarded the network contract because of its 'competitive price, creative design ideas, the proven System Ten hardware and software, a good commitment to the project and the enthusiasm of other System Ten users with whom the management services evaluation team spoke'.

One member of user management summed up the feelings about the new system by saying, "Although batch computer systems have revolutionised office procedures in recent years we have become increasingly aware of their limitations because of the in-built delay, which can exceed 24 hours. The introduction of on-line systems and visual display units now gives us immediate policy record access, enabling us to provide a much speedier service.

"The staff have become increasingly enthusiastic and confident with the systems and look forward to the time when all our office administration is conducted with the benefit of interactive on-line systems." □



Computer-printed policies have re-

NEW PRODUCTS, PRICES & PERIPHERALS FOR MID-RANGE 2900 USERS

A MAJOR series of hardware and software packages plus new enhancement options have been announced by ICL for users of its medium-sized computers.

The announcement provides users with financially-attractive 2946 system packages and an economical upgrade path from the 2946 and 2950 to the extremely cost-effective and successful 2955. There are also new data entry, text handling and information retrieval systems on medium-sized machines. The information retrieval system makes ICL's revolutionary Content Addressable File Store, CAFS 800, available with the 2946 and 2955 for the first time in special hardware and software packages.

In addition, ICL's Bulletin viewdata system, introduced on the ME29 earlier this year, is being made available on the 2946 and 2955.

The price of a packaged 2946 has been reduced by around 25 per cent. This means that a 2946 with one megabyte of memory, a Store Control Unit and a Device Control Unit (peripheral controller) and running DME, which allows 1900 programs to run unchanged on a 2900, will cost just over £120,000. A VME package, with the 2900 operating system running on a 2.5-megabyte 2946 with a Store Control Unit and two Device Control Units, will cost about £170,000.

While some users come into the 2900 Series at 2946 level others take a more gradual path, coming up through the 2905 and 2950 to the 2955 and beyond. Until now the leap from the 2950 to the 2955 has been a relatively expensive one involving the replacement of one complete processor by another.

Continual advances in technology, in its cost effectiveness and in production methods mean that ICL is now able to carry out the upgrade at customers' premises by exchanging circuit boards. The cost of upgrading from a 2950 to a 2955 is therefore reduced considerably, bringing the power, cost effectiveness and the VME/B and VME/B-E operating systems of the 2955 within reach of a wider range of computer users.

New features announced on the 2946 and 2955 include Wordskil, which provides ICL 7700 Information Processing Systems with 'electronic mail box', communications and mainframe file access facilities, plus a data entry system. This system, based on the established 7502 terminal processor, provides direct data entry, editing and validation in one hardware and software package.

The availability of CAFS 800 on the 2946 and 2955 makes this extremely fast information retrieval system more economical.

The speed and potential of CAFS have been described in detail by users, including Mary Newham, marketing director of Reed Executive Limited (*Computer International*, October-December 1980), and Basil Cousins, managing director of the big UK computer services company, Computel Limited (see page 14). ICL showed Reed Executive that CAFS is 50 times faster than traditional, software-based information retrieval systems and that it can handle enquiries involving information of doubtful accuracy.

Two CAFS packages have been put together by ICL. The CAFS Model 20, a 2946 with one megabyte of memory, two 80-megabyte disc drives and a CAFS controller with 240 megabytes of CAFS disc storage, costs £350,000. The CAFS Model 30, a 2955 with two megabytes of memory and 360 megabytes of CAFS disc storage, costs just over £420,000.

Another facility being made available with the 2946 and 2955 is Bulletin, ICL's viewdata system. The impact of viewdata on industry and commerce is potentially enormous in terms of cheap data capture, distributing information and even working from home. This announcement allows ICL users to be among the first to evaluate what viewdata could do for them and to put it into practice.

Bulletin enables people with no computing experience to access computer files easily using cheap terminals — namely television sets. Data can be transformed from existing files into viewdata pages, while more demanding users can examine and even update computer files in their existing form using a Bulletin terminal. Interactive facilities can also be made available on viewdata pages.

Other software announcements give medium-sized computer users the option of running CME, a major transition aid which enables a native 2900 Series operating system to be run at the same time as DME. It thus allows users to run 1900 programs on a 2900 under DME and gives them the option of simultaneously running VME.

An economical package of basic VME software has been put together by ICL for 2946 and 2955 users after a study of customers' needs and usage patterns. It includes a Cobol compiler, a sorting system, a screen editor and other basic utilities, plus the Interactive Test System, a program development tool which can significantly increase programmer productivity. The package costs about £800 a month.

There is a bonus for 2946 users in the availability of low-cost peripherals similar to those already offered with the ME29. They include versions of the PDS printer and 80-megabyte and 160-megabyte disc drives.

The new 2946 and 2955 packages and the 2950 upgrade path mean that users of the middle-range 2900 Series equipment are getting overall price reductions of around 15 per cent. Price reductions can be measured; the unquantifiable in these announcements is the extra efficiency and control which facilities like CAFS, Bulletin, Wordskil and the new data entry system can provide to organisations of all sizes. □

The availability of Bulletin (opposite) on medium-sized 2900 computers (above) allows ICL users an early opportunity to exploit the benefits of viewdata.

Christopher Wilson

A turn for the better

After a dip in profits last year and a first-quarter loss in 1981 ICL is fighting back towards profitability. Christopher Wilson talks to John Kavanagh about the company's future in a changing computer industry

COMPUTER companies must seek alliances with each other if they are to thrive in a fast changing industry. But whatever alliances ICL may enter the interests of its customers, staff and shareholders, will remain paramount.

That is the view of Dr Christopher Wilson, ICL's managing director, who also believes that the product and marketing rationalisation measures the company is taking — backed by recent bank loan guarantees — will give ICL breathing space in which to work towards a successful future.

"We're going through the third international recession in 10 years," says Dr Wilson. "The recession in the early and mid-Seventies didn't slow the growth of the computer industry. But this recession is significantly deeper and is affecting the industry's growth rate, particularly in the UK. Turnover is going up but orders are not. In fact the true growth rate at present is probably zero."

"The recession and the falling cost of technology mean the face of the computer industry is changing," says

Dr Wilson. "There is much more emphasis on services. And the margins are smaller on services than on computer systems. At the same time continuing advances in technology mean that a heavy investment in research and development must be maintained.

"About 18 months ago we at ICL saw the recession coming and knew that this, plus the changing nature of the industry and the cost of research and development, would force computer companies worldwide to rethink. We saw that the right way forward would be through alliances and we have been talking constantly to other companies with this in mind."

Dr Wilson points out that ICL has always examined ways of co-operating with other companies. It already has product agreements with Control Data for disc drives, Storage Technology for tape units and Logabax for printers. There is further international co-operation over technical standards and programming languages. Dr Wilson says ICL could play a major part in any alliances, having very considerable design, development, manufacturing and marketing expertise and resources.

Dr Wilson indicates his thoughts by stating that it would be vital for UK companies to enter any alliance from a position of strength. Says Dr Wilson: "From now on a nation's level of expertise will determine its economic well-being. Computer technology will not only pervade all areas of industry but more and more consumer goods will contain a high-technology element. There will be massive spin-offs. The UK depends on international trade for its survival so we must have technology at our finger tips. If we don't, the US could get a stranglehold on the windpipe of Europe through technological dominance.

Positive Contribution

"At present the UK has a balance of trade deficit of around £200 million in computing. ICL actually makes a positive contribution of £50 million. But if ICL's position changed the trade deficit could be at least £500 million a year.

"I believe that as a company and a nation we must recognise that we have responsibilities to ourselves and to Europe to ensure that we have a high level of technological competence and independence. This will mean we can seek those alliances as an equal, not from a weak position." Whatever happens on the alliance front, there is one certainty: "In all our discussions the interests of ICL, its customers and its staff are our prime concern. We must keep continuity of support to our customers. Hopefully these interests will be the same as the nation's."

ICL's support for its customers is positively reciprocated. The ICL Computer Users Association recently issued a statement headed 'Computer Users Association backs ICL'. It explained that the association's council had 'unanimously resolved' to 'publicly express its support for ICL'. The statement continued in this encouraging vote-of-confidence tone: "The majority of ICL users are running very successful installations which compare favourably with other manufacturers'." It concluded, "The ICL Computer Users Association wishes to express its continued support for ICL."

Rationalised Products

Dr Wilson is 'very delighted' with this statement, which was not canvassed by the company. Indeed, those customers, with a £2 billion investment in equipment and systems, are one of ICL's main strengths, he says. The others are 'the best product line in our history' and a development group which has done what no other computer manufacturer has done since: introduce a completely new product range.

That product range has settled down after its early teething troubles. And that can help put ICL back on its previous, profitable path: "Initially we had a multiplicity of products. At the top of the range we've had the 2970, the 2972, 2976, the new 2977, 2980 and the 2982, all separate products. But because of new technology we can now rationalise to fewer products. An example is the 2966. It can double or treble in size, so one product can cover a big range. This means we can make and sell 200 a year, whereas before we might be building relatively few of each model. In addition, we have invested heavily in manufacturing techniques and the products are now easier to make. The fact that the products are stable means we can embody new technology in them quite quickly.

"There are significant ramifications in this rationalisation. The cost of validating each new product can be as much as the development costs, so there are potentially enormous savings to be made. Such rationalisation helps the sales force, because the whole range of offerings is less complex. It helps in planning and the ordering of components. And it helps rationalise the engineering support set-up and the stocks of spares.

Prospective Customers

"Overall the sales force can be more specific about the markets they attack and the proposals they make to prospective customers, while costs are controlled much more closely.

"Overseas this rationalisation means we can say what we will do and not do, country by country. We can be more specific about what we sell and where. We can define tighter performance parameters, the staff will be more dedicated to specific markets and the engineering service will be more efficient."

If ICL is doing its best to cut costs sensibly the Government is playing its part by guaranteeing bank loans of £200 million over two years in excess of the first £70 million. In response four major banks have extended their existing banking facilities to the full £270 million.

"The Government guarantee is not a grant or loan," says Dr Wilson. "It's not a licence to spend money. In fact it gives us greater responsibility to operate efficiently. We've got to earn money before we can spend.

"This arrangement gives us a breathing space in which to restore profitability and generate a positive cash flow. The banking facilities will not only cover our operational needs for the period but will also provide some contingency."

Development Contracts

ICL and other UK companies look wistfully at other countries and the sort of support offered to the computer industry in the US and Japan in particular. Dr Wilson and the computer industry lobby body, the UK Information Technology Organisation, have long called for similar sorts of support in the UK (*Computer International*, January-March 1981). Dr Wilson has pointed out that between just 1972 and 1974 IBM alone had US government research and development contracts totalling $995 million. Who knows how much the recent space shuttle flight project meant in terms of similar contracts for US computer companies? Last year ICL had development grants of around £6 million for specific projects.

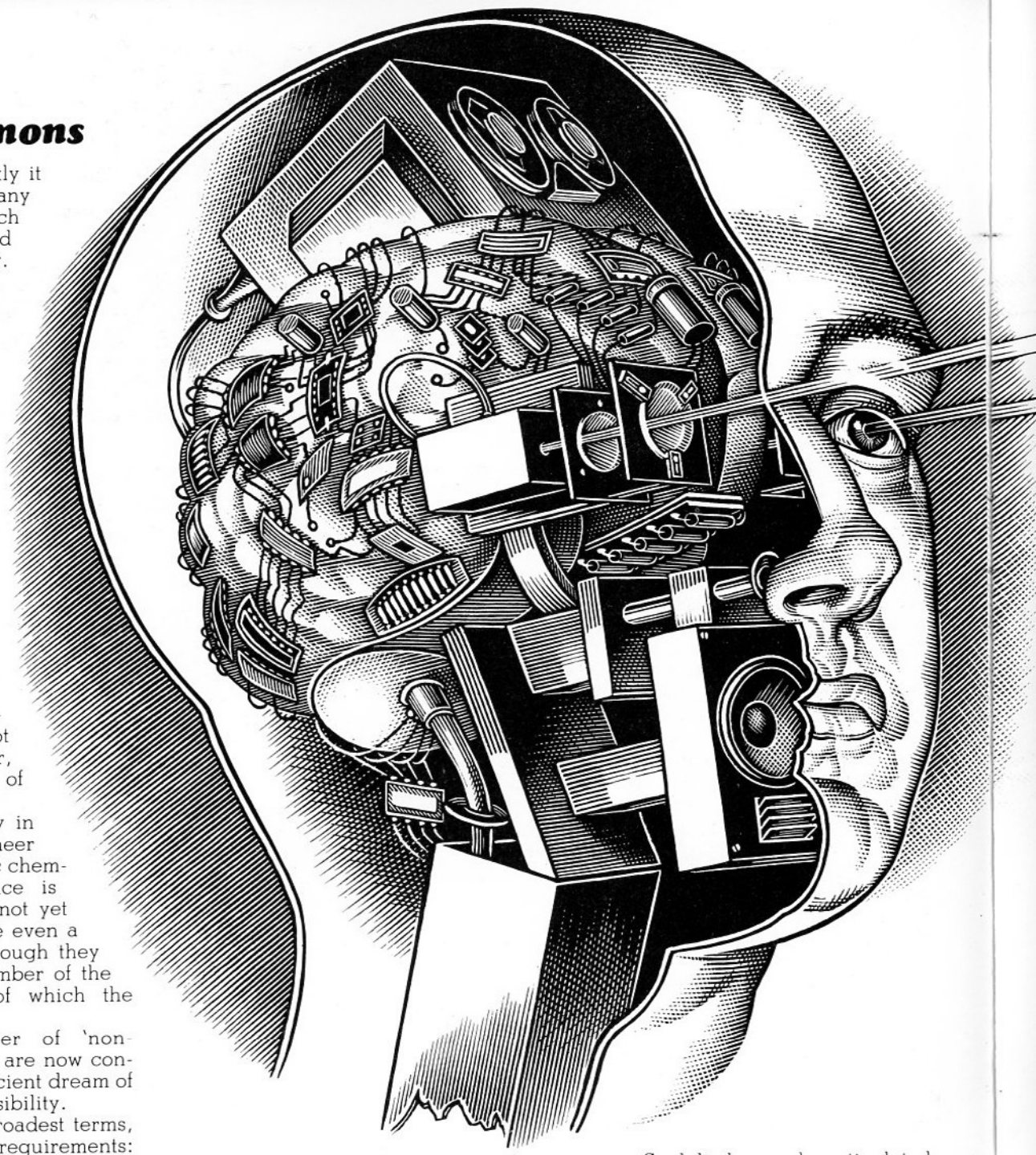
With the Government guarantee, new backing from the banks and several cost cutting and rationalisation measures under way, Dr Wilson feels the tide is turning. "The pressure's eased a little and we now have more time for putting our overall strategy into operation, more time for actually getting down to running the company.

"We were accused of not communicating with the world and of being caught out by the recession. But we saw the recession coming and felt that attracting publicity at that point would only make things worse.

"We can now be more positive and go out and tell the outside world what we're doing again. We can show them with results." □

FOR

by Geoff Simons



UNTIL quite recently it was assumed that any scientific approach to artificial life would be through biochemistry. This assumption followed the natural interest in the metabolic behaviour of acknowledged life forms. Life was defined in terms of our knowledge of biological systems and it was assumed that for any structure to be alive it would have to have a complex internal chemistry based on macromolelcules. It was felt that artificial life, if it were to be created at all, would be born in a test-tube in a chemical laboratory. The biochemist, not the electronics engineer, would be the creator of artificial life.

A principle difficulty in this approach is the sheer complexity of metabolic chemistry. One consequence is that biochemists have not yet been able to synthesise even a simple living cell, although they have synthesised a number of the macromolecules out of which the cells are built.

However, a number of 'non-chemical' technologies are now converging to make the ancient dream of artificial life a real possibility.

Considered in the broadest terms, a living system has two requirements: it needs to be embodied in a structure which can effectively interact with its surroundings and it needs intelligence to allow functional flexibility. These requirements are being made available by robotics and computer technology respectively.

It is worth emphasising that the two broad requirements are here defined in behavioural terms: living systems are defined in terms of what they do rather than how they do it. Life forms were recognised by their behaviour long before anything was known about metabolic chemistry. This means electronic systems which display behaviour characteristics of biological systems are at least as entitled to be regarded as alive as systems which behave in an appropriate way but which are based on hydrocarbon metabolisms.

Robots, often cast in the shape of human beings, have always been regarded as akin to living systems but they have been most represented in mythology and fiction. Today, however, practical, functioning robots are increasingly encroaching on fictional realms. There is an important sense in which a clear 'biology of robots' is emerging.

Robots do not have — nor do they need — spleen, heart or kidneys. But they do have a means of distributing energy throughout the system and a growing number of their components are equivalent to what we find in animals. There are robots with legs, arms, hands, sensitive skin, eyes, ears and brains.

A theory for 'adaptive walking machines' has evolved over the past decade, but there have been problems with joint co-ordination. These can now be solved using on-board microprocessors, an example of how local intelligence can help the efficient functioning of the organism.

Robot arms can also carry internal microprocessors, or local intelligence. Such limbs may be articulated or not. They may be strong enough to carry a car or may terminate in 'hands' which are sensitive enough to manipulate eggs without breaking them. Robots may have two arms or only one, as with most production line systems.

Robot hands can use the gripping action that characterises human fingers or exploit vacuum or magnetic effects. Artificial hands can exploit any method for locating and manipulating an object. Some robot hands come equipped with spikes or prongs to pierce items such as pieces of cloth, rubber or porous sheets.

Robots are also developing sense organs for sight, touch and hearing. By 1978, black-and-white television cameras were being widely used to provide a robot computer with an array image of brightness levels, the accuracy of the two-dimensional image depending on the resolution of the camera. And the US Auto-Place

MACHINA SAPIENS

Just how sapient have machines become? *Computer International* asks two distinguished authors for their view on this controversial subject of artificial intelligence

company developed a robot with a microcomputer and a pair of television cameras; a simple arm could monitor its own operations and learn to take appropriate action. This device was a clear precursor of sighted robots emerging today.

The sense of touch is provided by tactile sensors, already incorporated in functional industrial robots. Various research centres are developing 'artificial skin' transducers which give robots 'broad-area' tactile sensory facilities. One skin sensor has been incorporated in the fingers of a robot hand to allow the recognition of complex mechanical parts; in such a system, the 'sensitive spots' are akin to nerve endings.

It should be obvious that there is a well-established and developing field of robot biology. There is also a 'psychology of computers' which is gaining new significance through developments in microelectronics. Mental skills are often taken as a key factor in grading the earth's life forms; perhaps because this is a parameter that tends to favour human beings! But no fern or oak tree can play chess as well as even the simplest digital computer; nor can frogs weld car bodies as well as robots. The three-fingered mechanical manipulator is cleverer in some ways then the three-toed sloth. In terms of intellect, the computer or computer-controlled robot should be set well above plants and most animals. But to say that an artefact has intellect is not to say that it is alive (unless a semantic decision is taken that one entails the other). It is paradoxical, but not self-contradictory, that a system may be conscious and intelligent but not alive.

Many writers have suggested that computers can think. In 1972 Professor Frank George declared in *Computers and the Year 2000* that 'the ability to think logically has been shown to be within the capabilities of existing computers'. Since then other writers have noted that 'the machine is closing the gap between itself and the brain' and that 'it may be possible for a computer to have subjective experience'. At least one writer has considered whether automata can have dreams.

Some people insist that artificial life systems should be capable of reproduction or self-replication. This is an easy point to answer. First, many individuals within a living species are not capable of reproduction. Examples include worker bees which cannot mate, sterile men and post-menopausal women. Second, Unimation's PUMA robots can in principle be programmed to assemble PUMA robots. In the broad family of *machina sapiens* there is ample scope for self-replication through flexible programming.

The convergence of robotics and computer technology is generating a broad class of artefacts that is important not only to the notion of artificial intelligence but also to the idea of artificial life. Work on expert systems is demonstrating the dramatic developments in machine intelligence. Professor Donald Michie of Edinburgh University has written about emerging systems 'which not only outrun the intellectual reach of those who are supposed to interact with them but do so in a way which is opaque to human attempts to follow what they are doing'. This is a startling observation which is highly relevant to the emergence of artificial life systems. For it is the first time that such a thing has happened in the whole of biological evolution. □

Geoff Simons is the author of *Robots in Industry* and 12 other books and is currently chief editor at the National Computing Centre in Manchester.

AGAINST

by Dennis Rouvray

ALTHOUGH machines can perform some very remarkable feats and can certainly outclass humans in some areas — there is considerable doubt about whether fully intelligent machines could ever be constructed.

Currently it is possible for computers to perform arithmetic calculations at some 10 million operations a second. This means that in a few hours a computer can achieve what it would take a person a lifetime to accomplish. Machines can also pilot aircraft and submarines, play games such as chess, prove mathematical theorems, design vehicles and plant, replicate themselves and handle a host of other functions.

Do such capabilities really imply intelligent behaviour? If we are to be guided by one specialist's definition of artificial intelligence as 'the science of making machines do things which would require intelligence if done by men', our answer can only be yes, since all the abilities listed require intelligence. If, however, we interpret the question as being about whether the machine has a full human intelligence, the answer is certainly no. Machines could thus be said to possess limited but not full intelligence — which brings up the issue of what is intelligence.

To qualify as having human intelligence a machine would have to accurately reproduce a wide range of typically human characteristics. Among these would be the ability to discern patterns from tangled, incomplete or contradictory data; put together apparently unrelated data and ideas in novel and meaningful

combinations; make distinctions between seemingly similar data or situations; respond to situations very flexibly and take advantage of opportunities which present themselves; and appreciate a variety of aesthetic abstractions such as beauty and wit.

Clearly the realisation of full human intelligence in machines must be a very long way off indeed. Computers, robots and automata all have to be programmed in excruciating detail before they can function at all and even then they carry out their instructions rigidly, step by step. They show little if any sign of human flexibility, imaginativeness or creativity.

The dreams of the early pioneers in computing of constructing genuine 'thinking machines' have thus not been realised. Nowadays the term is no longer in vogue for it is realised that apart from important differences in memory and speed modern computers are no different from the early machines and that the epithet 'thinking machines' is certainly not applicable to them.

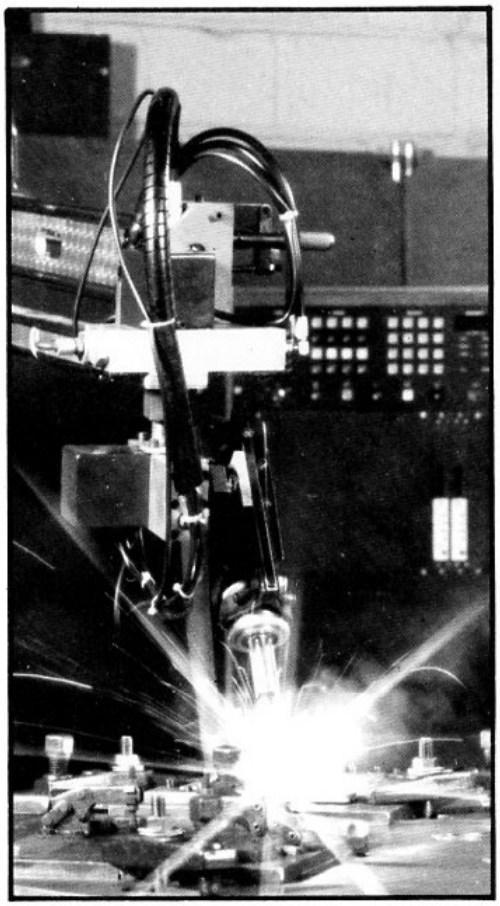
If we regard the human brain as the counterpart of the system hardware of the machine the software plays the role of the mind. Probably the most important feature of the physical brain are its 10,000 million nerve cells, or neurons. Each has several entry ports, or synapses, but only one output channel, or axon. The neurons are connected together by a very complicated network of dendrites.

Now, as there may be as many as 200,000 entry ports for a single neuron, there will be up to 200,000 separate inputs which have to be summed before this one neuron can reach a decision. A decision will trigger an electrochemical pulse of ions which will pass along the axon and out into the dendrites. However, even before the ions reach the end of an axon, they encounter many bifurcations. This means they reach their destinations at differing times. The brain has an unknown mechanism for converting these truncated signals into coherent messages.

In spite of many decades of active research, only the macromechanisms of the brain are at present fairly well understood; the micromechanisms are virtually unknown. Thus, to insist that all the functions of the brain can be accurately modelled by electronic or similar devices is premature to say the least. A fully thinking machine would, moreover, have to display an awareness and a responsiveness matching that of humans. It would have to react not only at the mental or intellectual levels but also at the emotional, intuitional and perhaps even the mystical levels. A profound insight into some very subtle and

In short, to make any real sense of human utterances and actions a machine would need a detailed knowledge of the world around us: how it feels to be alive and to participate in the manifold activities in which human beings engage.

This points to a major difficulty which is encountered in the construction of any intelligent machine: the difficulty of producing a machine which can get outside of itself in the sense of being able to reflect on its situation and realise that it is a machine constructed by human hand. At present this confronts us with an insuperably difficult problem and it is one which will certainly not be solved in the near future.



Robot at work. Is it sufficient to define artificial intelligence as the 'science of making machines do things which would require intelligence if done by men'?

Of the ultimate goal of artificial intelligence work is ever to be attained all the brain's major functions will have to be modelled electronically or perhaps electromechanically. While it is true that the dendrites between the brain's neurons resemble electronic circuits in a digital computer and the dendrites are thought to transmit their electrochemical pulses in binary format, such superficial similarities should not lead to unfounded optimism that artificial intelligence will shortly be created.

To date two main approaches have been adopted in artificial intelligence studies. These have been dubbed the 'simulation' and the 'performance' on the attempt to duplicate accurately the actual operation of the brain in thinking and responding, whereas the performance mode is concerned with duplication of the end results of thought processes. Neither has been notably successful, although some limited progress has been possible with the performance mode.

To understand the reason for this lack of success it is necessary to consider the nature of the research. Work has focused mainly on the playing of games such as chess, the translation of languages, the solution of mathematical problems and recognition of patterns.

Such activities normally involve the searching of a very large tree to find the appropriate solutions. Machines always do this by brute force; they examine every conceivable possibility. The brain, on the other hand, tackles such problems much more elegantly, using heuristics.

Heuristics drastically reduces the amount of searching which has to be done by discarding unfruitful lines of approach. For machines to be really effective in searching trees they would have to be capable of finding paradigms for generalising problems. In all machines invented so far such paradigms are generated by the software; present-day machines are thus inherently incapable of solving such problems in the manner of the brain.

Because the ultimate goal of constructing a fully intelligent machine is clearly a very elusive one, belief in it can be no more than an act of faith at present.

Even though that ultimate goal cannot be achieved in the forseeable future, a number of major advances will be made within the next few decades. These will probably include the construction of machines which can perform calculations at speeds several orders of magnitude faster than is currently possible, translate languages accurately, play chess at grandmaster level and recognise very complex patterns. Research activities in the cognitive sciences — of which artificial intelligence and cybernetics are but two — will also no doubt lead to some powerful new insights into the nature of intelligence and the operation of the human mind. Yet if we wish to penetrate significantly beyond the limits outlined it will probably be necessary to have recourse to biological systems. In the last analysis it would seem that we shall not be able to dispense with good old-fashioned human beings. □

Dr Dennis Rouvray is the author of nearly 100 scientific papers. For the last 18 months he has been director

FROM GOLDEN MAIDS TO INTEGRATED CIRCUITS

PEOPLE have always been fascinated by the possibility of artificial life. The Babylonian deity Marduk was supposed to have used the blood of a defeated god to make the first man, while the Christian god is said to have made man from the dust of the earth.

In more practical terms Hephaetus, the Greek god of mechanical arts, was supposed to have made golden maidservants who could speak and walk and were filled with wisdom.

In the Middle Ages one of the earliest automata, built around 1250, was smashed by Thomas Aquinas as the work of the Devil. Leonardo da Vinci made an automatic lion in around 1500 in honour of Louis XII of France. It approached the king as he arrived in Milan, opened its breast with a claw and pointed to a French coat of arms.

The notion of mechanical calculating engines dates from the early seventeenth century. The first was built in Germany by Wilhelm Schickard. Pascal in France and Leibniz in Germany subsequently designed engines which could add and multiply.

The enormous potential of computing devices was first fully recognised by the Londoner, Charles Babbage (1792-1871). Although he designed two machines, neither was built. The first, the difference engine, was for generating mathematical tables, while the analytical engine was to posses a store, or memory, and a mill, or hardware for performing calculations. The devices were to be made from thousands of interlocking cylinders.

Babbage's ideas were a seminal influence. It was he who first envisioned numbers being manipulated in his 'mill' under the control of a program punched on a series of cards. This idea was inspired by a card-controlled Jacquard loom which could weave patterns to 'any design the imagination of man may conceive'. This insight has given the modern computer its universality and in particular its ability to perform non-numeric computations. One profound consequence has been that the data input and the program have become interchangeable; either can be operated on in memory. The era of the 'thinking machine' had dawned.

In his endeavour to automate computation Vannevar Bush built the first differential analyser in the 1930s. Unfortunately, because of his obsession with analogue devices he virtually ignored computation based on the more straightforward digital approach by electronic means. The first digital computer, the ENIAC, was constructed in 1946. It was tested by John von Neumann on scientific problems for developing atomic weapons. After this computer had been replicated many times, industry began to enter the picture.

Scientific programming, the invention of the magnetic core for larger and more reliable memory and the introduction of solid-state devices to provide faster and smaller switches ushered in the modern era. And breakthroughs with integrated circuits in the 1960s meant artificial intelligence research could come into its own. □

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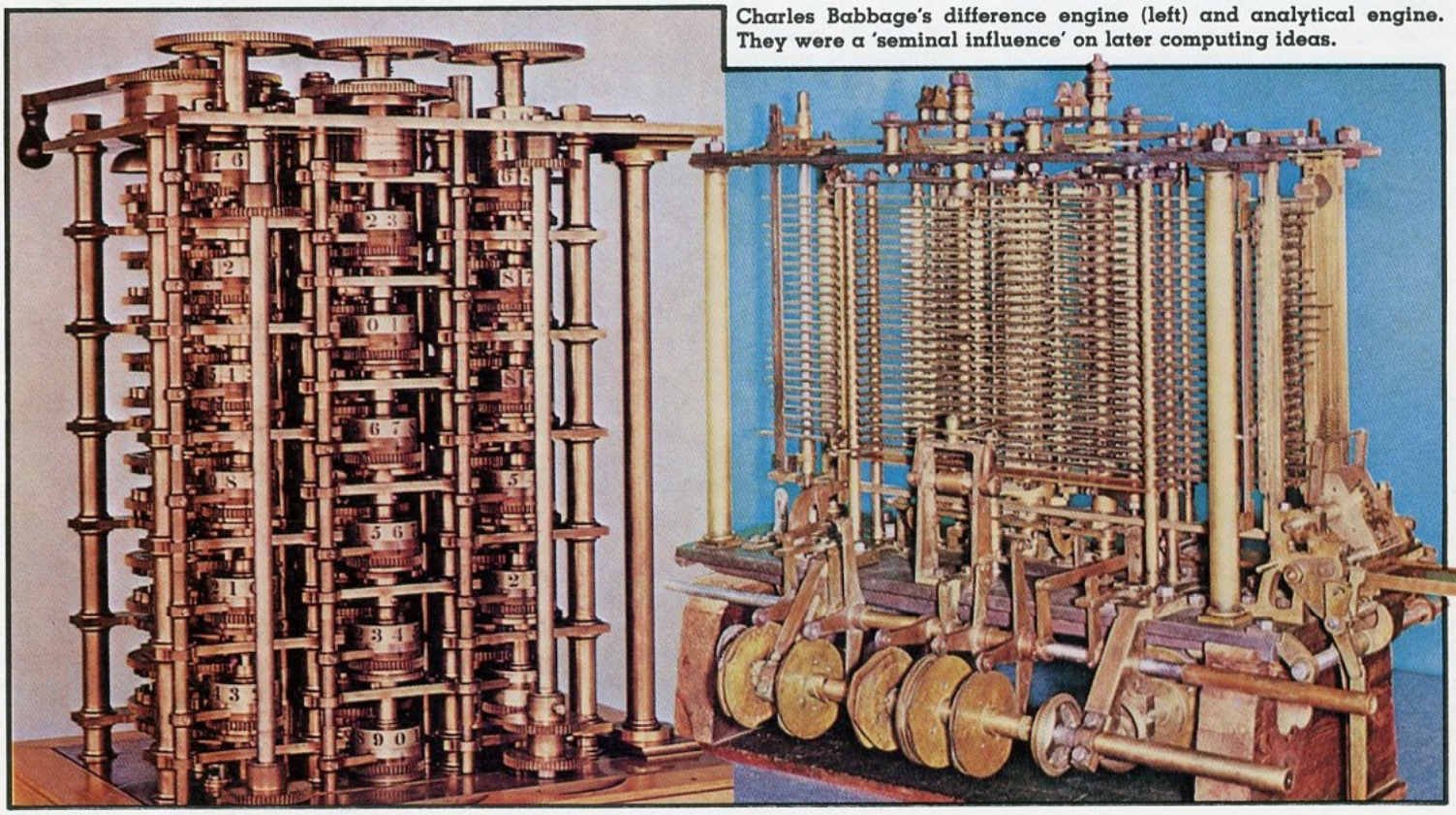
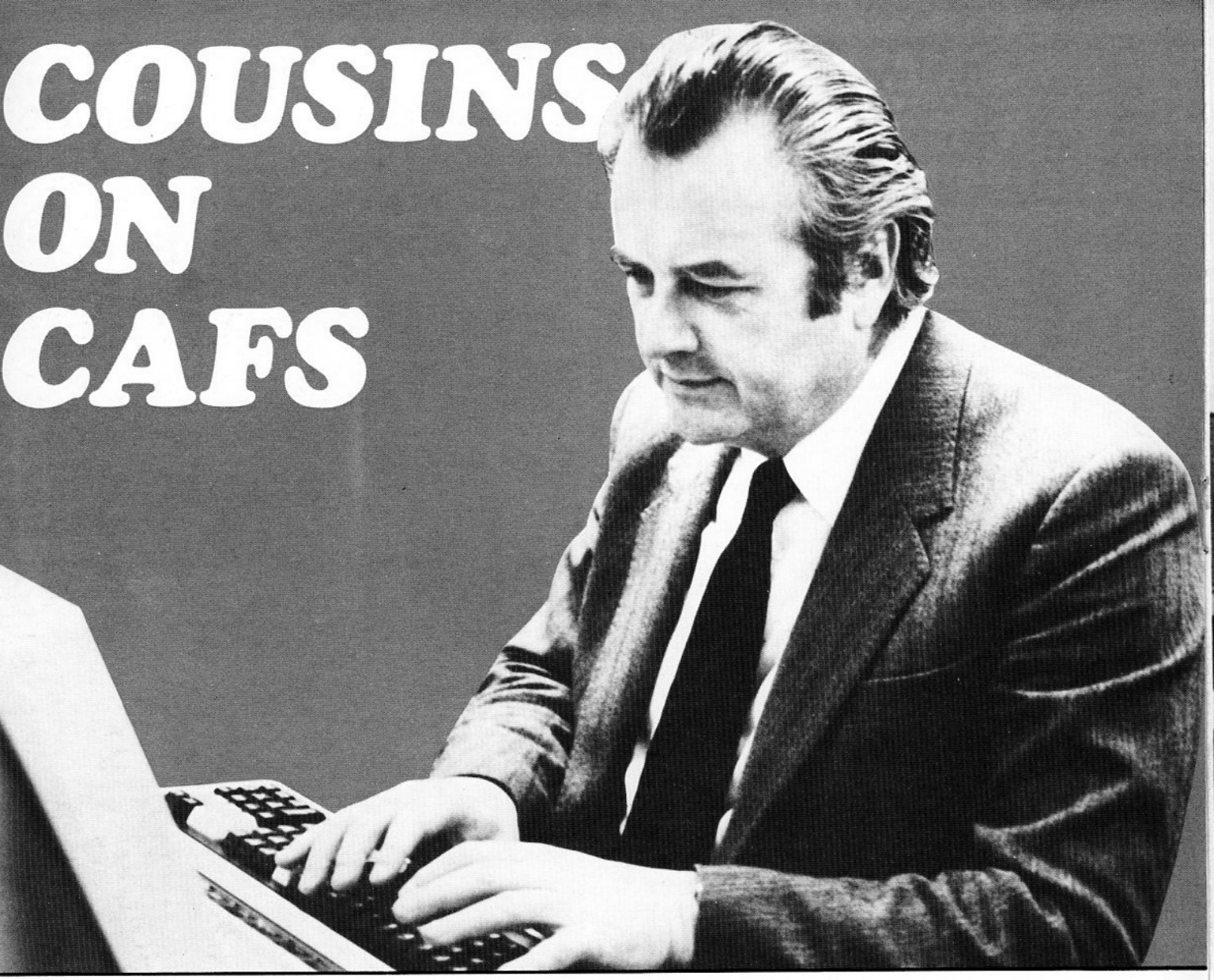


Charles Babbage's difference engine (left) and analytical engine. They were a 'seminal influence' on later computing ideas.

COUSINS ON CAFS



THE demand for traditional data processing has flattened out and a vast requirement is emerging for handling unstructured data in a simple and logical manner through the use of array and parallel processors.

That is the view of Basil Cousins, managing director of the big UK computer bureau, Computel Limited. And his commitment to that view is shown by the fact that Computel has recently installed a CAFS 800, ICL's Content Addressable File Store, and is considering the company's equally revolutionary Distributed Array Processor. Computel already runs three single ICL 2960 mainframe computers, a dual 2960, a 2976 and an ME29 at its centre in Bracknell, Berkshire.

"Research has shown that a massive 90 per cent of databases now being planned will be unstructured text," says Mr Cousins. "There are software solutions around but the way they handle the information means the inverted files can be three to four times the size of the original data. With CAFS you can handle unstructured information in a sensible and economic way.

"The DAP and CAFS handle modelling and unstructured data in a totally new way, a 3D way, to the extent that the battle between computer manufacturers to get more millions of instructions per second out of their processors is no longer relevant."

Not only does CAFS handle unstructured information; it also makes setting up the database relatively easy. "We can demonstrate the freedom CAFS gives very easily," says Mr Cousins. "We can go to a potential user and say, 'Give us a tape of any existing data and we'll put it on CAFS and you can ask any questions you want of it.' We did a demonstration for a House of Commons Select Committee using a tape of journal abstracts from the National Computing Centre. We had it ready in two days. It was very simple to set up."

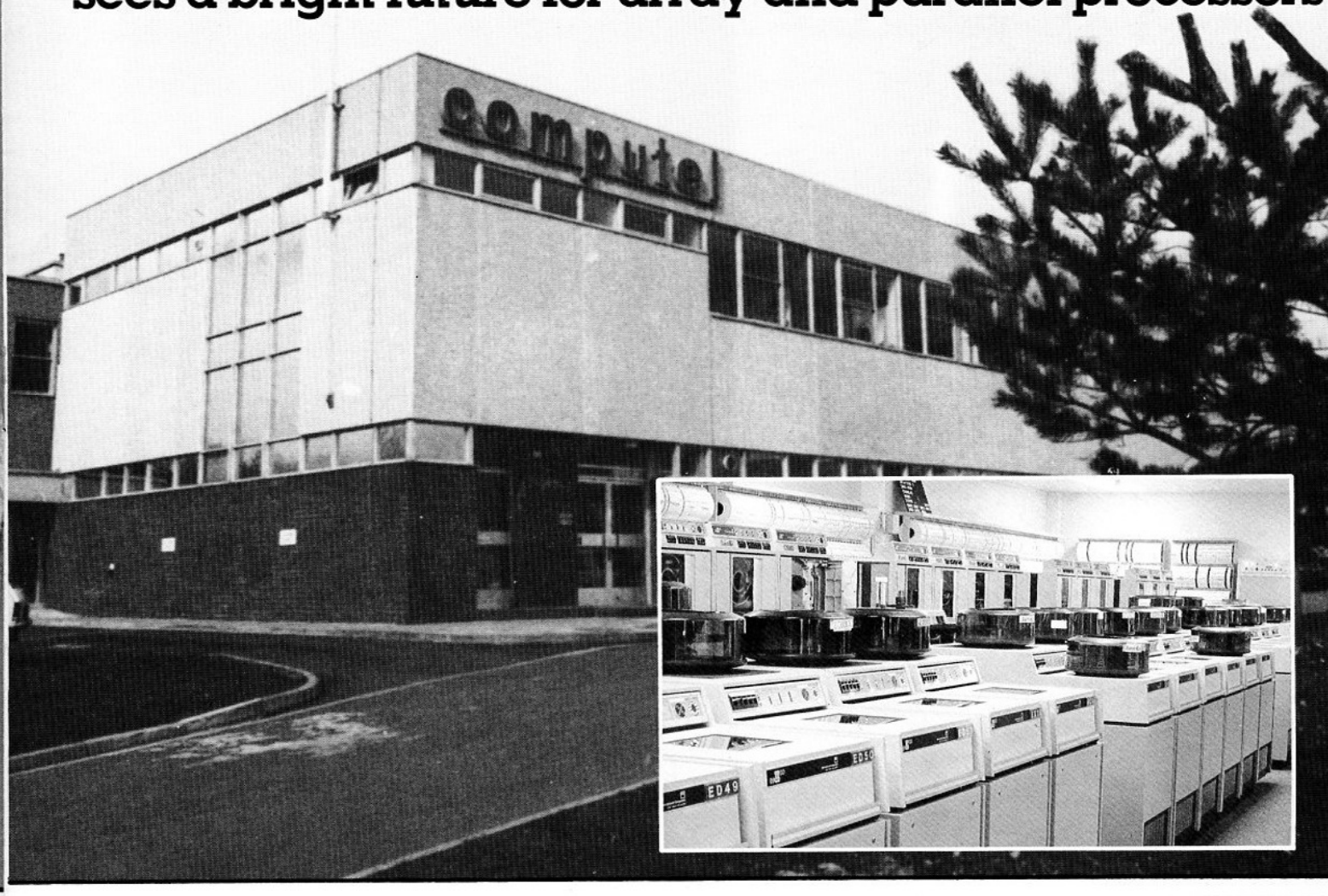
What sort of databases of unstructured information will users be looking for? "One example is in word processing: the storage of letters, memos and reports," says Mr Cousins. "They're traditionally kept in filing cabinets or as a pile of print-out on the floor, so no one looks at them. If they were on disc and could be accessed easily through a terminal the information which they contain could be used effectively."

Another possible use for CAFS in the automated office lies in links with viewdata systems, which have not taken off as quickly as hoped in the business world: "Viewdata gives a good presentation but the access method is limited. The user needs to be able to do some real searching through a tie-up with a CAFS-like device."

This suggestion opens up the need for a more complex viewdata keyboard with alphabetic keys and is perhaps moving away from the easy-to-use nature of viewdata with a numeric keypad. Such a keypad is, however, very limiting. But Mr Cousins points out that CAFS can cope with enquiries involving information of doubtful accuracy: the user simply puts a question mark in place of the questionable information. As a simple example, if a user does not know if a name is spelled Reid or Reed he can enter RE?D and the system will display information on Reid, Reed and Read.

As Mr Cousins puts it, "With CAFS

Basil Cousins tells John Kavanagh why Computel sees a bright future for array and parallel processors



The vision of Basil Cousins (opposite) is backed up by Computel's hardware investment strategy. A CAFS 800 operates alongside a huge configuration of 2900 equipment at the Bracknell computer centre (above) where three 2960s, a dual 2960 and a 2976 are installed.

you can't go wrong. It can be easily used by an amateur."

The idea of links between CAFS and viewdata to get the best out of both systems raises the possibility of similar links with other structured information retrieval systems. Computel is now examining possible CAFS links with ICL's database software, IDMS and with the Status text retrieval system.

"CAFS has a market lead which gives ICL a tremendous opportunity," says Mr Cousins. "Indeed, here at Computel we've never had a new product which has brought us as many sales leads as CAFS has done."

Having installed CAFS, Computel is now 'very seriously interested' in the DAP: "The DAP has a large, defined market. It can reduce the cost of computing by handling multi-dimensional modelling far better than straight software."

DAP users attach the device to a 2900 Series processor in place of a four-megabyte storage module and the DAP can, in fact, serve as a normal store when not being used as an array processor.

Mr Cousins believes that with devices like CAFS and the DAP the information handling business of 1983 and 1984 will be vastly different to the data processing industry of the mid-1970s.

In the meantime, however, Computel's main business involves its three 2960s, the dual 2960 and the 2976. CAFS is attached to the dual 2960. The 2976 runs under the 2900 Series operating system, VME/B, while the 2960s run DME, the system which allows 1900 Series programs to run unchanged on a 2900 computer.

The mainframes support a nationwide communications network, with multiplexers located in many of the major business centres.

Computel is now considering the potential of the smaller user, providing ready-to-use systems. ICL's ME29, which has proved very successful in its first year, could be the key here: "The ME29 would be our main vehicle for turnkey systems. It also gives us the opportunity to build advanced networks for our customers."

Last autumn Mr Cousins told the 2900 Club that ICL 'still has a bright future' and that Computel's technical people were happy with VME/B. He reiterates that the software is 'a lot better': "It's very reliable and resilient now; we have very few software failures."

With VME/B well established, Computel is starting to consider ICL's new Information Processing Architecture. "In the future there will be a universal exchange of data across countries and machine ranges," says Mr Cousins. "The IPA type of open networking must be good as far as this is concerned: any computer will be able to talk to any other and exchange files and so on."

But whatever the future brings, Mr Cousins is sure that VME/B will be the key: "VME/B will open the way to IPA, CAFS, DAP and everything else." □

Signal Supplies System

The British Army reveals its plans for updating and expanding a world wide computer network

CHIEFTAIN tanks tend to be rather more robust than the average family car. But even Chieftain tanks need spare parts now and then. They need ammunition to be effective. And their crews need everything from pistols to pullovers.

Extend the problems of keeping a Chieftain tank somewhere on the northern plains of Germany fully equipped to supplying the entire British Army stationed throughout the world; it soon becomes clear why the Army has an on-line and off-line computer network linking places as far apart as Hong Kong, Germany and England.

For the last 10 years the network has been based on two central ICL 1900 computers. It is now being considerably updated and expanded with the installation of two ME29s, two 2960s running under DME and a dual 2900, probably a 2966 under VME. Another 11 ME29s and many extra 7500 terminal systems are being installed around the world to give more Army locations both on-line access to the central databases and the potential for self-sufficiency in case of emergencies.

This massive network is run by the Directorate of Supply Computer Services, DSCS, part of the Royal Army Ordnance Corps. Just as RAOC is the Army's sole supply organisation, so DSCS is the sole provider of Army supply computer systems. Its terms of reference are to develop and implement systems for use anywhere in the world, to operate systems run in the UK and to maintain technical control of systems run overseas. All development work is done at DSCS headquarters at Graven Hill on the outskirts of Bicester, near Oxford.

The officer responsible for carrying out that considerable brief is Brigadier Lawrie Lawrence, head of DSCS and the man in overall charge of all Army supply computer equipment and systems around the world.

"The idea is to have all hardware and software expertise together rather than fragmented and thus avoid duplication," said Brigadier Lawrence. "Absolutely no major software is produced outside Graven Hill. That applies even if a system is not going to be run in the UK at all but somewhere overseas."

Most of DSCS' end users are in West Germany — the British Army of the Rhine, BAOR — but its potential 'customer base' includes Hong Kong, Cyprus, Gibraltar, Belize in Central America and Canada. "We support them by placing a computer in the overseas theatre if necessary or through links to our computer centre. But everything remains under the control of Graven Hill."

DSCS has terminal links to its main computer centre, the central inventory control point, some three miles away at Arncott. A new wing has been built there to house the 2960s, 2966s and two ME29s.

The main computers overseas at present are 1902s in Hong Kong, Berlin and BAOR in Viersen, West Germany.

All this equipment keeps track of RAOC supplies around the world to ensure both that Army units are fully equipped and that stores are kept at safe but economical levels.

The main systems cover equipment, ammunition and spare parts. The equipment system handles 3,500 different types of Army vehicles and equipment. It tracks all these items throughout their lives, giving information such as where an item is at any time, who is responsible for it, where it is going next and when it was last serviced.

Similarly, the ammunition system keeps track of 1,000 main types of ammunition, from rifle bullets to missiles. Within those 1,000 main types is a myriad of sub-types.

Keeping a Chieftan tank fully equipped and supplying troops on manoeuvres are just two of many tasks for DSCS computers.

Technical and stock control databases support the ammunition system, providing research and analysis facilities to specialists as well as inventory information. If any ammunition malfunctions the system helps trace not only all other rounds of the same type but also the other types of ammunition with the faulty component.

By the end of this year BAOR will be on-line to the equipment and ammunition systems in a big way — and also self-sufficient. For in addition to putting terminals into Army depots to give access to the central databases DSCS is also installing ME29s to support databases covering local geographic areas. ME29s are being installed at three equipment depots, two ammunition depots and BAOR headquarters and at three equipment depots and two ammunition depots in the UK, with 7500s at several administrative headquarters.

In addition, six stand-alone Data General CS30 configurations provide a real-time issues and accounting system at each of the Army food supply depots in BAOR.

Despite these major enhancements the central database systems will be largely unaffected, because they are to be transferred from the 1900 equipment to the 2960s under ICL's DME, which allows 1900 Series programs to run unchanged on a 2900 Series computer.

What is changing is the spare parts system. At present it is written in ICL's Plan language for the 1900 Series and although partly on-line it is geared towards batch processing. The system links up Arncott with Hong Kong, Berlin and Viersen and has two UK satellites, a 2903 at Chilwell and a 2904 at Donnington. It is being completely redesigned and rewritten in Cobol as an interactive system to run under the 2900 Series operating system, VME/B.

The system handles a massive 903,000 different items and 30,000 transactions a day. By 1984 the number of transactions is expected to double and the inventory will top 1.3 million item types. The IDMS database to support this inventory will have 100 record types and 115 set types and will consume some 3,000 megabytes of storage.

If a set of spark plugs is needed for a Chieftain at a workshop in West Germany the mechanic goes to RAOC for it. As the plugs are taken from the store the relevant stock card is amended. If stocks are short a message is sent through one of eight communications centres, equipped with Datapoint 2200 equipment, to the ICL 1902 in Viersen.

The 1902 shows if the requested spares are available at the main depot in Germany. If they are not the request is sent from the 1902 to the central Arncott system, which locates the requested parts at a UK depot and transmits issue instructions to the satellite depot printer.

If a spares request is really urgent a signal — the Army equivalent of a telex — is sent to Arncott. A terminal operator checks the stores availability in real time and immediate instructions are automatically transmitted to the depot.

A 1902 is also installed in Hong Kong but the Army's existing courier and signals network is sufficient to support Cyprus, Gibraltar, Canada and Belize.

The spares system works out re-order levels and quantities for each item and location. It keeps track of orders for unusual items and if one location is ordering regularly it highlights the fact that it might be worth having a permanent stock there. Similarly, it highlights the fact that another location is not getting through its stocks of certain items as quickly as expected and helps adjust the re-order levels and quantities.

The system has proved very successful in its 10 years of operation. "We've been able to cut plump inventories, some by as much as half," said Brigadier Lawrence. "We've also managed to reduce staff levels. Several other governments have adopted the system philosophy."

DSCS is using the armed forces' Bureauwest computer bureau at Devizes, Wiltshire, for system development. It has an ICL 7500 terminal system linked to the big 2900 Series mainframes there.

The new spares system will go fully live in 1984 on the dual 2966. By then the existing terminal network will have been expanded significantly and the 1902s at Viersen and Hong Kong will have been replaced. ME29s are being evaluated for Berlin.

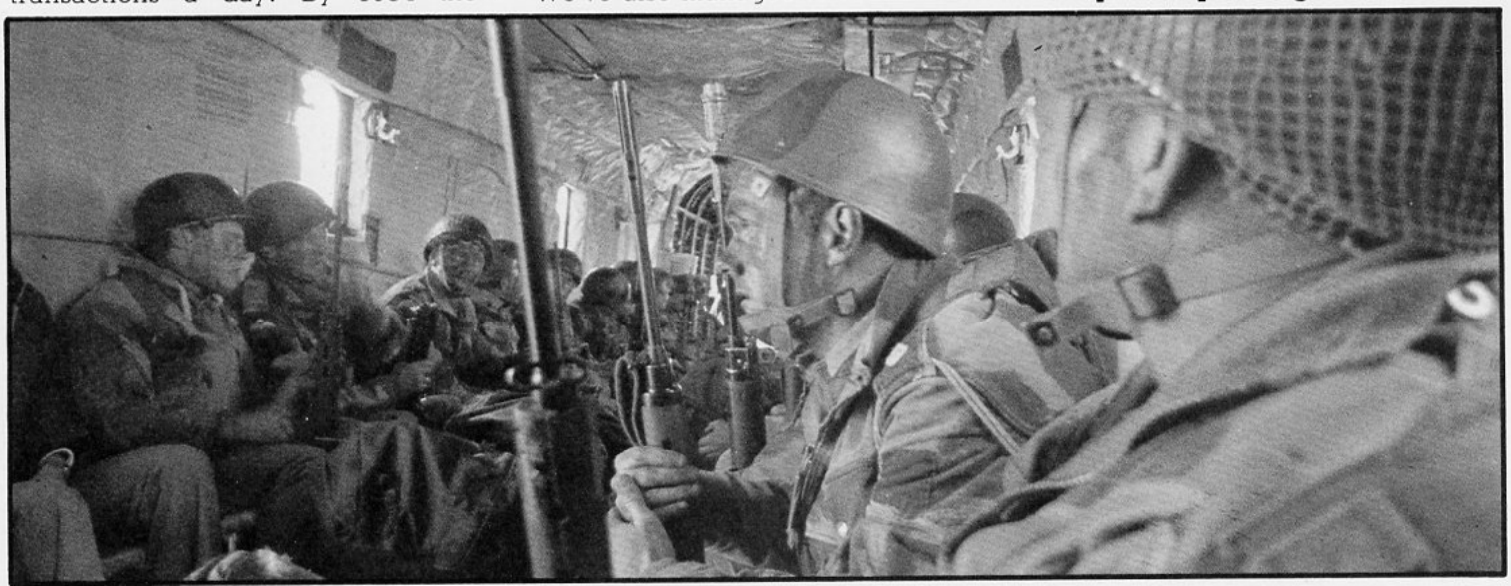
At the same time DSCS is evaluating the possibility of providing computers at individual RAOC unit level to replace the manual cards system. As an experiment it has fitted a four-ton lorry with a ruggedised microcomputer. Further equipment has been linked to this system by fibre-optic lines to show the possibility of giving, say, soldiers in a tent a mile or so away access to information through a portable terminal.

As well as providing closer control over local stores such a system could provide information in several different magnetic media forms for transfer to the central system.

The potential of the equipment, ammunition and spare parts systems was demonstrated last autumn by the Ocelot exercise (*Computer International*, October-December 1980). Ocelot showed how RAOC could react to a major ammunition explosion in Germany, using the systems to divert reinforcements, find and release replacement vehicles and spare parts and locate and ban the use of other ammunition with the same components.

Given the sophistication of the DSCS computer systems and the extent of its network it is clear that if such emergencies — or worse — arise, RAOC will be ready. □

Troops ready for night exercises.



Phone-in service desk for small systems users

Neil Kerr and the customer service desk: "We provide one contact point for all types of enquiry."

THE tremendous success of ICL in small systems, especially with the System Ten, has led to the introduction of a new support service. The new customer service desk provides a focal point where all small system customer calls can be handled.

In many cases the desk staff will solve problems immediately over the telephone; failing that they will ensure that the details of the enquiry or problem are passed to the relevant sales or support person for quick action.

"In the past the customer would phone different numbers depending on the problem," said Neil Kerr, the customer service desk manager. "If it was a hardware problem he would phone the nearest engineering centre. If it was a software problem the customer would need to know where the relevant support person worked. If the customer had an administrative query or wanted some more equipment it was a case of knowing which ICL office the sales person worked from.

"The customer service desk provides one contact point for all these different types of enquiry."

The desk is manned by specialists in software support, engineering support, services and administrative matters. They have been picked for their ability to solve problems on the telephone. Experience shows that over 90 per cent of non-engineering problems can be dealt with over the telephone.

"The engineering specialist can find out if the customer's problem really is to do with engineering," said Mr Kerr. "If necessary he can help the customer reconfigure the system over the phone and prevent wasted time. If there is a hardware fault the engineer can often find out which parts are likely to be needed and the urgency. He can then contact the local engineers and give them detailed information on the nature of the fault before the site visit takes place. All this means faster resolution of the fault and less downtime."

In addition to dealing with hardware and software faults the desk takes calls on everything from brochures, training courses, magnetic media and stationery to invoices, delivery dates and environmental matters.

A System Ten computer is also helping to improve the service to System Ten users. Details of all calls are logged on the desk's system for on-line management control, monitoring, chasing and statistical analysis.

"We record the relevant facts," said Mr Kerr. "We enter the nature of the call, when it was received, who dealt with it and what the solution was if it was a problem.

"From this information we can analyse problems and avoid re-inventing the wheel every time the same problem comes up. If a particular fault appears to keep occurring the analyses will highlight the fact and we can do something about it. In the meantime we can find out the solution on the last occasion and save time by using it again. We aim to provide a faster, more professional service to our users and increase customer satisfaction as much as possible."

The first desk is in London and covers the South of England. Other desks will be set up later in the North to provide a full UK service.

Mr Kerr concluded, "The small business system user generally requires his computer as a business tool and he relies on it being efficient and resilient. We think that providing one point of contact cuts down on wasted time and helps the user to concentrate on running his business." □

SCOTS TAKE STOCK OF SYSTEM TEN

Four small businesses in the Glasgow area highlight their early experiences as successful first-time computer users

Computing benefits all types of companies, including timber merchant Woyka, department store John Orr (inset, top) and pressure guage manufacturer Buchanan Brothers (inset, bottom).

THERE comes a time at even the smallest company when the manual accounting systems, perhaps helped by an accounting machine or ledger card computer, are no longer sufficient. Business grows to the point where better stock and credit control become necessary to keep stocks at efficient levels and improve cash flow. The company then has to choose between employing several more clerical staff and moving on to a computer system.

Four companies in the Glasgow area which have faced these circumstances in the last 18 months have moved from visible record systems into on-line computing. All have installed ICL System Ten 120 business computers, thus joining the 10,000-plus users of the long-established System Ten family of small machines.

John Orr and Sons (Airdrie) Limited is a family-run department store specialising in furniture and fashion. A large proportion of its business — 70 per cent — involves four types of credit account. Any customer can have one or more of each type of account.

As a credit sale is made the details are sent along a pneumatic tube from the counter to the accounts office. While the goods are being wrapped an accounts clerk checks the customer's credit in terms of the number of accounts held, the credit limit and whether payments are overdue. Clearance is sent back to the counter.

It is clearly important that all accounts are up to date from minute to minute; if not, a customer could go from counter to counter opening new accounts, while someone who had just brought an account up-to-date could have a request for a new account turned down because that last payment was still waiting to be recorded.

The accounts office also handles payments from account holders. On Saturdays it might handle 450 payments, plus 300 from travelling collectors. Each one used to involve finding the relevant ledger card, making an entry and replacing the card. It is little wonder that the manual files were not up-to-date; in fact the company was always two or three days behind.

The accounts are now handled by an ICL System Ten 120. Information about a customer's credit position is available instantly to the accounts staff through three video terminals, which are also used to enter payment details. As a result, the accounts are all immediately up-to-date.

The effect on the company has been extremely significant. "As far as our customers are concerned we are giving much better service," said Chris Ormerod, the managing

customers are concerned we are giving much better service'

director. "And the management has far better information in far less time. We have much better control of debts; we can find the bad payers and chase them sooner. We get credit analyses whenever we want. This just wasn't feasible before. At the end of the year our debt valuation for the Inland Revenue used to take 50 or 60 man days; it now takes four or five."

While John Orr wanted more efficient account handling, John Woyka and Company Limited wanted a system which could cope with the unusual stock problems of a timber merchant.

"The timber trade is different in that in most instances the customer is not invoiced with precisely what he ordered," said John Baxter, the company accountant. "He might order 100 metres and get 20 pieces, each 5.1 metres long. If we met each order to the letter we'd be left with a lot of useless off-cuts. So the system has to be able to record the order and allocate stock initially and later amend the stock levels when the amount of timber actually delivered is entered."

Woyka chose the Strip package developed for the System Ten by another timber company. An important factor in the choice of Strip was that the system leaves complete control of decisions in the hands of the people who know the timber business.

"There are always many products which can satisfy an order and Strip allows the person taking orders by telephone to immediately offer the customer alternatives in terms of availability and price," said Mr Baxter.

"The computer disposes of time-consuming, routine manual tasks such as stock evaluations and provides us with instant information.

'What the computer does is get rid of the routine jobs and provide instant information'

Our managing director has a terminal on his desk and this will give him immediate access to the relevant information necessary for efficient decision making."

as far as invoicing was concerned. The previous, manual system, backed up by a visible record computer, had imposed fixed-period invoicing on the company. Invoices could now be printed and sent at any time, which meant faster payment. In periods of high interest rates this alone would pay for the computer, he said.

A more straightforward stock control system was suitable for Finnie and Company Limited, a wholesaler of hand tools and general ironmongery for do-it-yourself shops. The problem here, however, is the large number of products — 8,000, ranging from saws and chisels to padlocks and drill bits — and a complex discount structure. This necessitated specially-designed software, which was produced by a local consultancy.

Orders are entered to the system, which handles the discount structure for invoicing and produces a picking list showing the requested items in an order related to the layout of the shelves.

'Assembling and checking of orders has been speeded up tremendously'

"The assembling and checking of orders has been speeded up tremendously," said Michael Fischbacher, a director of Finnie. "It takes a third of the time it used to. And the fact that the system handles all the discounts has given us a big saving in routine work."

Stock control and order processing was also the problem at Buchanan Brothers Limited, a manufacturer of pressure guages and thermometers for industry.

"Stock control is so time-consuming if it's done properly manually," said Alexander Buchanan, the managing director. "The trouble was that we were sometimes ordering more items than we needed from our suppliers while at other times we'd run out and not be able to cope with urgent orders."

Today, Buchanan's System Ten 120 is providing up-to-date stock information at any time. As an order is received a code representing the product is entered, with the required quantity. The system produces a production document, using the product code to look up the complete specification, the price and the cost of the materials.

At this stage the materials are allocated but not written off; the decision to make the products still rests in human hands. If an urgent order for the same product comes in

second. As the products are made the system is informed and it writes off the materials. Thus the people who know their industry and their customers keep the flexibility to decide on priorities and production schedules.

As the order is despatched the relevant records are updated with the postage or other carriage charge and the invoice is produced.

Why did these companies, all of which looked at several major computer manufacturers, decide on ICL and the System Ten 120?

IBM was apparently too expensive for the companies which considered it. Some of the others had software packages but those packages did not come close enough to meeting the companies' needs. One supplier was described by two of the companies as having faulty equipment, untested software and staff who had insufficient knowledge of equipment and software.

For Woyka the choice of supplier was fairly straightforward: the Strip package was available and proven through use. Like the other companies, Woyka is also using ICL payroll and accounting packages on its System Ten 120.

The large number of existing satisfied System Ten users helped convince Buchanan and Finnie. Mr Fischbacher at Finnie also found ICL 'businesslike and very reliable'. Mr Ormerod at Orr described ICL as 'the most amenable'. Buchanan and Orr felt that ICL's proposal gave the best value for money. Mr Ormerod added, "ICL's total package, including support and back-up, was probably the best."

'For a small business like ours you want the computer to be just another piece of office equipment'

In all cases the computer system had caused relatively little disruption to existing operating methods. No computer staff were needed and the System Ten 120s were installed in existing office space with no extra air conditioning. As Mr Buchanan put it, "For a small business like ours you want the computer to be just another piece of office equipment, like a typewriter. You want to be able to just press the button and see it run."

These four companies are clearly enjoying considerably improved efficiency and customer service as a result of pushing that button on the System Ten 120. □

Homework stops brain drain

In the face of a growing international shortage of professional computer staff, Judith Morris reports on a pioneering ICL scheme to retain valuable intellectual resources

A WOMAN'S place is in the home, they used to say. This implied that when a woman got married and had a family her days as a career girl came to an abrupt end. Opportunities for working at home, apart from domestic chores, were mostly limited to such tasks as addressing envelopes or taking in laundry.

For highly qualified people it was a depressing prospect. For employers like ICL it was a costly drain on scarce intellectual resources in an industry hungry for trained professionals.

ICL's answer, begun a decade ago, was to find a way for people to continue working — but from home rather than the office. In doing so the company pioneered a programme which has gained broad acceptance and paved the way for other organisations. Today, ICL employs more than 200 'homeworkers', including 15 men, who either do not want to be confined to office working or do not wish to work full-time.

Hilary Cropper, manager of the company's Bracknell-based customer services sector, started the trend herself when she was forced to give up her job a decade ago. "I wanted children but I was also very career minded," she said. "Luckily, my manager rang me up and asked me if I could do some work at home, which I did. I have just returned to work full-time after 11 years, which includes two years when I did my current job while living in Knutsford. I flew down to Bracknell two days a week and did the rest from home. And now I am certainly as senior as I would have been if I had never left at all."

To begin with, Mrs Cropper's homeworkers were in charge of system maintenance work. Full-timers did the development work. "With this kind of project," explained Mrs Cropper, "it doesn't matter where people live and there is little need for face-to-face contact or on-site visits. They have to attend meetings once a month, which is important if only from the motivation angle."

But, as time went on, more and more women with commercial programming experience became interested in the scheme. Using terminals in their own homes, they could work as an off-site team providing they were close enough to others working on the same project and they were prepared to visit an ICL site or a customer when necessary.

The other type of work which lends itself to the off-site scheme is technical writing. "We have had great success with this, because the amount of physical contact needed is containable," said Mrs Cropper.

The Company demands at least four years' work experience and a good working record. Homeworkers are classed as ICL employees, not freelance or contract staff, and as such are

entitled to all company benefits, including salary, sick pay, holidays, grading and promotion.

"It is important that the people giving out work understand the problems of off-site work," said Mrs Cropper. "This is why the people managing the scheme also work off-site. The jobs have to be suitable for the type of staff we have and the locations in which they live. Now, people ask for our assistance with projects rather than call in contract staff. We have built up a good reputation."

All the arguments against working at home do not stand up in the face of a professional, well-organised body. The question of training, for example: how do people working remotely keep up with a rapidly changing industry? Standard ICL courses are reshaped to last two days, so most people can attend, or audio courses using tapes and manuals can be used at home. "When you're talking about people with donkey's years of experience," explained Mrs Cropper, "they can pick things up very quickly. In fact, someone told me the other day that it was more sensible, with an eye to the future, to spend money on staff this way than it would be to build huge office blocks."

Sue Webster had been working for 10 years in data processing when she left to have her first baby. At that time, she was working on ICL's data dictionary. "I really enjoyed my work and the project was very exciting," she said. "I never really thought about giving it up. Someone asked me if I was going to carry on from home, and I did. And I have no regrets at all."

She has been working at home now for three years, working 16 hours a week with one day a week in the office. She has a Transdata terminal in her home and does most of her work in the evenings.

"So much happens that you can't afford to let it all go past," she said. "Even when the children are grown up, I would prefer to work like this, as it means that you are flexible and can go shopping or visit friends when you want, as long as you put in the time for work. And I find work just as satisfying as I did when I was working in the office full-time.

"In fact," she continued, "there are fewer distractions at home even with two small children than there are in an office, where people are wont to go off chatting. I do about two hours a night of concentrated work and I have a childminder once a week when I go into the office."

But working at home is not just advantageous to the employee who wants to spend more time with his or her family. Nor is it a way for a company to use what was traditionally cheap labour. At a time when there is a definite shortage of qualified, experienced staff, particularly in the programming field, it means that industry can retain and use skills which otherwise would have been wasted. As Mrs Cropper pointed out, the average time-span for a woman to have children and get around to wanting to return to full-time employment is 15 years. In computing, such a person would have to virtually start all over again, no matter how much she knew before she left her career.

Kay Maycock also has two small children, aged two-and-a-half and four. Formerly with sales and support in Putney, she became a homeworker when her eldest child, Joanna, was six months old. She works on software maintenance for the System Ten payroll package, PAYPAC.

"If you want to do it, you can manage," she said. "I started by doing 16 hours a week and now do 20 to 25. It's all a matter of organisation. I work in the mornings and in the evenings and handle a lot of queries on the telephone. I have a childminder once a week, but I don't

Sue Webster organises her busy schedule to accommodate separate periods for work and for play with sons Nicholas (left) and Jeffrey.

like to send the children out more than that. That's not what I had them for."

One thing both women were agreed on was that working at home was an ideal situation in itself and not just something people did for a few extra pounds or to fill in a few hours. The image of homeworkers has changed considerably over the past few years and is now one of professional people rather than bored housewives.

"One of the reasons some companies are loath to employ women," said Mrs Maycock, "is that they are frightened of losing their investment in that person when she leaves to have a family. But this need not happen. And it shouldn't happen. For example, there are very few PLAN programmers around these days, but the language is still used so people are needed to support it. So those women who have left full-time employment with those skills are vital."

The organisation of people such as those employed off-site by ICL could play an important part in the office of the future, when more and more people could be deployed throughout the country working on projects and communicating by telephone links or terminals.

Mrs Maycock, working on the System Ten, does not have a terminal at home. It is not necessary. She goes into the Bracknell office to use the equipment there or else uses the machines at ICL's training centre in Old Windsor.

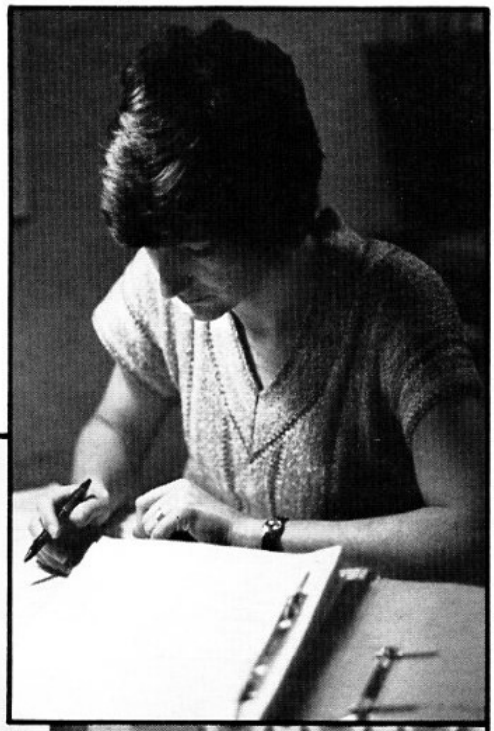
"Homeworkers are no slower than full-time people; they put in fewer hours," explained Mrs Maycock. "But those hours are more concentrated and nobody chooses to work this way unless they really enjoy their work, so it is more committed."

Sceptical remarks about children scribbling over printout are unjustified, if you are well-organised, according to Mrs Maycock. There is nothing to suggest that these people are less professional in their approach to work than those who work in an office.

As for the future, tomorrow's world could well be based on the system used by ICL's off-site workers. As the price of hardware continues to fall, the possibility of programmers working from home becomes more and more logical. "There is a lot of work that you can do sitting at a workstation," said Mrs Cropper. "As the machinery gets smaller and cheaper, people can just put them in their cars and take them home to work for a day or two."

Flexibility, more than spare time, is the key issue. At the moment, this type of work is usually done by women with children and the industry which taps this resource more than any other is the computer industry. But there is no reason why other industries, using computers, should not change the conventional definition of a working environment.

Mrs Cropper concluded, "At the moment, the low-cost small computers are not sophisticated enough for development work to be done on them and them alone. But in a few years' time, with hardware prices continuing to fall, it will be possible to equip homeworkers with all the computer facilities they need. Then, who knows how work patterns will change?" □



When Kay Maycock is not working in her office it becomes a play-room for Alex, aged two, and four-year-

ICL MARKETS SHARE REGISTRATION PACK

The bustle of London's Stock Exchange. Behind the scenes Registrar helps public companies keep track of share movements.

A SHARE registration system written by registrars and proven through several years of daily use is now available to company registrars and share registration service companies from ICL.

The system, called Registrar, currently handles the share registers of some 40 public companies for Close Registrars Limited, including some of the most active gold mining companies. Close Registrars is part of Close Brothers Limited, which provides a range of merchant banking services in the City of London.

Ray Whitehead, managing director of Close Registrars, says the overall advantages of Registrar are better service to shareholders and company management, made possible by far easier access to information, and a reduction of paperwork to the absolute minimum.

The Registrar share register holds full details of each shareholder, from the name and address to the tax codes, certificate numbers and the number of shares held on each certificate. Each shareholder is identified by name, certificate number and the number of shares on each certificate; there is no reliance on cumbersome account numbers.

The register can be accessed through video terminals if necessary, while microfiche provide an economical way of storing and distributing a printed version for reference by management in distant offices, by the public and any other interested parties.

When shares are transferred the original transfer documents are used by registration staff for entering the details. This means that existing staff can easily adapt to the system.

Built-in checks ensure that all the necessary information is entered. The system then updates the share register and automatically produces share certificates. A transaction report shows details of buyers, sellers and shares transferred.

Shareholder analyses are also produced. The registrar or company secretary can thus keep large shareholders under constant review and keep track of all share movements easily.

In addition to standard share transfer work Registrar automatically handles dividend payments and reconciliations plus bonus, rights and new issues. Tedious routine jobs such as printing shareholder address labels are also handled automatically.

When dividends are due Registrar calculates the necessary tax deductions for different situations, using tax codes, which are automatically generated from a shareholder's address. Registrar produces a complete dividend list for checking, plus dividend warrants, sorting them into home and overseas areas for postage. For large companies it allows bulk distribution of dividends to the UK clearing banks for clearing to shareholders who have mandated payments to any branch of those banks.

This level of facilities is also provided by the bonus, rights and new issues parts of the system.

Registrar has been run by Close Registrars on a computer bureau but in the last year the company has developed a version for its own ICL ME29. Registrar is thus available as a stand-alone system on an ME29 or as a software package for other ICL machines.

ICL and Close Registrars are working together on the system, ICL providing the technical expertise and Close Registrars seconding professional registrars to help with the training of share registration staff where necessary.

As a stand-alone system on an ME29 Registrar can take advantage of ICL's Bulletin viewdata system (*Computer International,* January-March) to provide shareholder information on ordinary television sets to company management or, in the case of share registration service companies, to their clients.

Registrar is suitable for any country using the English share transfer system; it is already used in South Africa and discussions with certain Middle East countries are in progress.

Mr Whitehead sums up Registrar as 'a Rolls-Royce system' which offers users the benefits of an up to date and very secure system, running on one of ICL's latest computers, while at the same time being well proven through several years' use by professional registrars. □

BY the summer of 1980 the British Broadcasting Corporation had expanded its computing in just 10 years from a 32K ICL 1909 to a 256K 1904S, a 2972 and a dual and a single 2960.

The 1904S was finally switched off at the end of the year. Systems which had not yet been converted are now running on the single 2960 under DME, which allows 1900 Series programs to run unchanged on a 2900 computer. The ultimate conversion of these systems and the number of new applications in the pipeline has already started the BBC thinking about an upgrade of the dual 2960.

Pressure on the BBC as a quasi-public organisation to be as cost efficient as possible is the main reason for the rapid growth of its computing. The turn of events in the late Seventies has also played its part.

When ICL introduced the 2900 Series at the end of 1974 the BBC was quick to realise it would one day have to move across to the new range. When the 2960 was announced it was one of the first in the queue.

"We looked at Honeywell and Univac but we had a good relationship with ICL and decided it was better to stay with the devil we knew," said Bob McLean, head of computer services.

"We also felt that transition to the 2960 would be at least no more traumatic than converting to another manufacturer. Besides, that other manufacturer would eventually bring out its own new range, so there would probably be yet another conversion."

The 2960 arrived in 1976 and the BBC set about converting directly to the 2900 Series VME/B operating system because DME, or even the prospect of DME, had not been announced at that time.

At the same time the BBC developed an on-line videotape cataloguing system. Producers wanting information or film on any topic from cooking to politics could now find it more easily and prepare their programmes more quickly. The system is needed 16 hours a day, 364 days a year.

Meanwhile, the early VME/B teething troubles meant that batch work, multi-access terminals and transaction processing systems did not run well together. The need for a back-up computer for the essential videotape library system, the ever increasing demand for new applications and a decision to ease the extremely heavy VME/B load by splitting conversion and production work led to the installation of a second 2960 in 1978.

Then came the strict government pay policy. Computer staff, already in short supply, started to swap jobs as the only way of increasing their salaries. "The wage freeze blew our conversion schedules away," said Mr McLean. "We were badly hit by staff losses."

So the BBC turned to DME, which had now been announced. By mid-1980 a dual 2960 had been installed to take over the production systems already converted and running on one of the single 2960s. A 2972 took over conversion and development and one of the original 2960s became a DME machine to take on the rest of the workload from the 1904S, which was now well past retirement age.

Mr McLean said he was 'very impressed' with the new processors: "Our tests suggest that the dual 2960 is at least one-and-a-half times as powerful as a single system, while the 2972 matches ICL's claim that it is 3.4 times the power of a 2960. Our users have noticed a dramatic decrease in response times at multi-access terminals in particular."

VME/B has had mixed reactions. "We spent a lot of time tuning George 3 very finely on the 1904S and then ran for four or five years without touching it," Mr McLean explained. "When VME/B came along the users kept comparing it with George 3 and thought it was unreliable and generally below par.

"However, our technical people and development programmers like it. They find it easy to use. In fact one on-line system was developed in six months by two trainees. There's no way that could have been done under George. Generally speaking program development now happens at least twice as fast as under George."

There is heavy use of on-line facilities. Some 150 terminals are supported and the dual 2960 is dedicated to transaction processing during the day.

Apart from the videotape library system the on-line applications include a system which provides financial control of capital projects such as rebuilding studios, a stock control system associated with the production of equipment such as monitors, which the BBC makes itself, and a programme costing system.

This system shows how much has been spent on each television production and compares those costs with the budget.

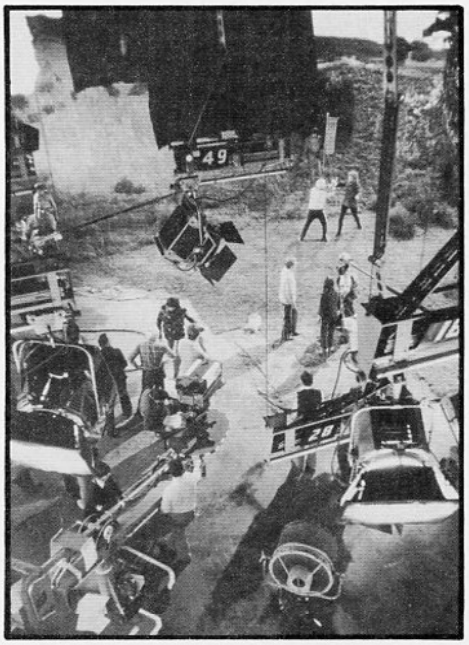
In addition to payroll and pensions applications the BBC has a studio allocations system, which helps it make the most efficient use of its studios, an audience research system using the SPSS survey analysis package and several systems handling the sales, invoicing and despatch of publications associated with BBC programmes.

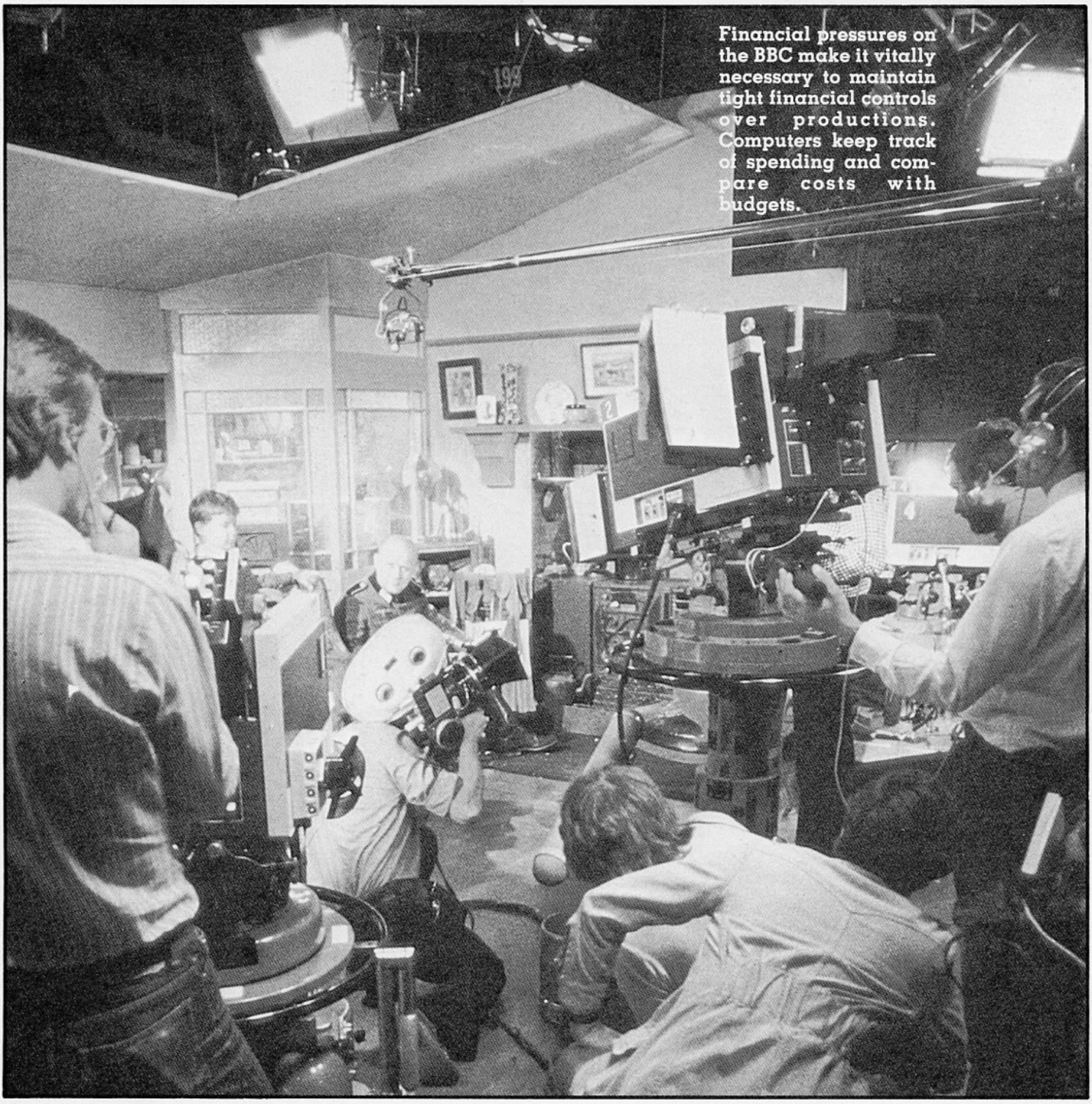
The systems are produced by 120 staff split into nine project teams. The teams are responsible not to Mr McLean but to their user departments, so the computer services department is in effect providing a bureau service to the programmers and analysts.

Mr McLean's staff are split into four groups. There are 60 operations staff and 60 in data preparation. Another 12 are in technical support, a group which supports and thoroughly tests operating system releases, communications hardware and software and database systems. All releases of VME/B are tested for at least four weeks before being made available.

A group of three people handles small systems — anything which is not associated with the mainframes.

The BBC has come a long way in computing since 1970 and operates much more efficiently as a result. As Mr McLean says, "There was very limited knowledge about data processing in the BBC 10 years ago." Today he is thinking about the next upgrade for an already considerable 2900 configuration. □





Financial pressures on the BBC make it vitally necessary to maintain tight financial controls over productions. Computers keep track of spending and compare costs with budgets.

NEW FACTORY TERMINALS

The 9600 at work

ICL'S 9600 Series of Factory and Attendance Terminal Systems has been enhanced with the addition of three new terminals and two software packages which will further strengthen ICL's presence in the factory terminal systems business. The company already has a third of the UK market and a substantial share in others abroad.

The new terminals are the 9602 and 9603 Factory Terminals and the 9606 Attendance Terminal. The software packages, Industry 3 and Industry 15, have been developed to drive the new terminals from the ICL 9630 and 9635 Factory Terminal System controllers. This new software enables manufacturing organisations to set up data capture systems in a few days. Once running they need very little specialist supervision.

The 9602 and 9603 Factory Terminals are compact, robust and simple to use. Variable data can be entered through a sealed, pressure-sensitive numeric or alphanumeric keyboard, while fixed information such as a personnel or part number can be input on 10-column plastic badges. The 9603 can also accept 80-column punched cards. These terminals can thus provide the means for collecting data about job bookings, stock and personnel movements.

Both terminals have a 240-character display screen. This can be used to display sequences of instructions to guide staff as they enter data, while authorised staff can retrieve and display information such as a job's status, details of the next job, the location of components and stock levels.

A 9602 and 9603 can hold 10 transaction programs in its own memory, supported by a battery. Programs which are used less frequently can be loaded from the controller when required. These transaction and user guidance programs can be specified and amended easily by the organisation's own staff. User identity checks can be built into the transaction programs.

The 9602 and 9603 have diagnostic routines for ensuring that the terminals are working fully when they are switched on and to make maintenance simpler.

The new 9606 Attendance Terminal replaces the earlier 9605. It is a wall-mounted device with a large 12- or 24-hour clock display. Clocking in and out, using an industry-standard plastic badge, is quick and simple and helped by the terminal's badge ejection mechanism. Clocking rates of 40 badges a minute are possible — much faster than with conventional systems.

Different warning sounds tell the badge holder whether the badge has been accepted or not.

If necessary the information could be listed soon after the starting time, thus helping to eliminate the delays and costs resulting from intermediate checking activities associated with conventional clocking systems.

As well as capturing information about the movements of people the 9606 can help monitor the movement of vehicles and materials and control access to restricted areas. In fact the 9600 Series is already used in areas such as banking, hospital administration, retailing and mining, where new security, time-keeping and safety systems are being introduced.

All the new terminals have horizontal badge slots to prevent dirt getting in.

A key element of the 9600 Series is the Industry software, which runs in the controllers to provide real-time links between terminals, controllers and other key parts of the overall system, including the user's master files.

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Order book

New Australian network

Three of ICL's new 2955 computers are to form the heart of a distributed, on-line order handling system at J Blackwood and Son Limited, the leading Australian industrial and engineering supplies company.

The £750,000 order includes over 100 video terminals. It was awarded to ICL after an examination of several mainframe manufacturers.

Two 2955s will be installed in Sydney and one in Melbourne. Blackwood's branches in Brisbane, Newcastle, Blacktown and Canberra, plus the 2955 in Melbourne, will be linked to the Sydney computer centre. The terminals will handle enquiries, orders and delivery information. The complete distributed system will be controlled by ICL's VME/K operating system, while applications will be based on ICL's IDMS database software.

Bank's best buy

A Japanese financial organisation in London has ordered an ICL ME29 and associated software valued at £87,000.

The Japan International Bank Limited provides retail and wholesale banking and security services in a wide range of international currencies. It is owned by a consortium of seven leading Japanese banks and security organisations.

Applications will include accounts control, providing Bank of England returns, internal accounting and management statistics.

Delivery was an important factor in the Japan International Bank's choice of computer because it was on the point of opening a new headquarters in the City. ICL was able to deliver and commission the ME29 within days of the order being signed.

Hong Kong STARS

Two Hong Kong companies are installing System Ten computers to run STARS, ICL's business control package.

These new customers are the Kwan Tye Loong supermarket chain and the Cafe de Coral fast food company.

Cafe de Coral is a fast-growing business with 30 outlets in Hong Kong being added this year. But such expansion has brought problems: with meat, vegetables and other ingredients being served and delivered to each outlet on a daily basis, over 400 purchase invoices are being generated every day.

Cafe de Coral's owner, Wellos Limited, wanted a packaged system and chose the System Ten and STARS. It is initially using the general ledger and accounts payable parts of the system and will later add sales analysis and payroll.

Kwan Tye Loong expects its System Ten 120 to help improve service to customers through better stock control. The system will help supermarket managers keep their display shelves full while reducing stock holdings to more economic levels.

In addition, tighter financial control through streamlined accounting and invoicing procedures, also made possible by the system, will lead to extremely competitive pricing.

An attraction of ICL's System Ten and STARS package was the fact that Kwan Tye Loong could install real-time computing without having to set up a specialist computer department.

Dutch treaty reinsured

An ICL 2955 has been ordered by Ennia Insurance Company (UK) Limited, a Dutch-owned insurance company operating in the London market. It will replace a 1902T.

The order, won against strong competition, includes a two-megabyte 2955 running under CME. This will enable VME/K to operate at the same time as DME, the system which allows 1900 Series programs to run unchanged on a 2900 Series computer.

The 2955's price performance, the ease of transition from the 1900 computer, ICL's IDMS database system and a comprehensive support service were among the reasons why Ennia chose the ICL equipment.

Applications will include Ennia's highly-regarded treaty reinsurance system, RIMAN, which is marketed in the insurance industry.

ICL ousts Fujitsu

ICL has won an order for two ME29 Limited, a group with interes ranging from photocopiers to tiles.

One ME29 will replace a Faco 230/15 from the Japanese man facturer, Fujitsu, at the Océ su sidiary Crosby Tiles Pty Limited South Melbourne. It will hand accounting, on-line order entry ar financial and management inform tion applications.

The Crosby Tiles ME29 will b linked to the second ME29 at Oc Reprographics Limited Melbourne, using ICL's Informatio Processing Architecture. At Oc Reprographics the ME29 will take c accounting and sales applicatio currently handled by a loc computer bureau. It will also hand financial modelling, the asset regist and on-line order processing ar production control.

The ME29's extensive facilities ar the availability of the IDMS databa software and PROSPER financi modelling package contribute significantly to the decision to chan to ICL.

Swiss sales system

One of Switzerland's leading retaile is moving into point-of-sa computing on a large scale this ye with the installation of 622 IC terminals supported by 13 System T computers.

The company, Manor AG, has sp the country into regions, each havi a number of stores. A System T with 100K memory and 80 megabty of disc storage is being installed each regional administrative centr

ICL 900 and 9500 Series point-sale terminals in the stores are bei linked to local concentrators or some cases directly to a System Te One store, La Placette in Genev will have 120 terminals.

Periodically during the day tra actions will be transmitted from t terminals to the System Tens processing.

Manor AG has 70 stores and 7,0 staff spread throughout Switzerlar It has a very high turnover products and needs tight cost contr Each store has a six-month budc and its returns are monitored to sh its progress against that forecast. I in this area that computing can pro particularly effective, processi high volumes of transaction data highlight weak areas and enal

NEW FACTORY TERMINALS

continued from page 29

It is the Industry software which handles enquiries from 9600 terminals, the validation of input and the setting up of transaction control programs and guidance instructions for terminal users. It also provides the links with master files or application systems. Complete 9600 Factory Terminal Systems can be set up in days using the Industry software.

Industry 15 runs on the 9630 controller, which is based on the established ICL 1500 small computer. Industry 3 runs on the 9635, which is based on the ICL System Ten, of which over 10,000 have been sold around the world.

The 9630 can handle up to 24 terminals. Data is recorded for processing later by the user's application programs. The 9635 can support up to 160 terminals. It can run Industry 3 at the same time as application systems, if required. The user can therefore run completely self-contained production planning and control systems using a 9635 running Industry 3 and suitable application software, or use a 9630 or 9635 purely as a sophisticated data capture and terminal control system. The 9600 system controllers can be linked to ICL, IBM and other manufacturers' computers.

ICL 9600 systems are now installed throughout the UK and Europe in manufacturing organisations producing items as different as engine components, telephone exchanges, washing machine controls and watches. Benefits being achieved by these organisations include reduced work in progress, increased throughput, fewer overheads and much better use of management and staff time through a reduction of errors and paperwork.□


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