WHAT WAS MAKING THE NEWS IN MAY
into space age
computer environment,
with the new Compatore

Mk.4

The launch of the new Compatore Mk.4 projects computer environmental control into not one, but two exciting new dimensions. Outwardly, Compatore Mk.4 is only 20.3 cm in depth, and this superdimension allows the unit to be mounted completely unobtrusively within the computer room. Inwardly, new Compatore Mk.4 breaks into a new dimension of efficiency in close, zoned control computer environment. That means the provision of the precision environment needed by the computer to ensure the desired return on capital outlay by Denco Miller—the pioneers of precision computer environment whereas they have made yet another breakthrough and they are anxious to provide you with all the details.

Denco Miller Limited, Norton Road, Heston, Middlesex, England. Tel: (081) 58142. Telex: 22144.
Sheffield Office: "Tyrwhitt", 28-43 Shalesmoor (5540 NS) 21238
Scottish Office: Forth Road, Broughton, Tel: 041-432 4111.

DENCO MINTER

ALLOTTING THE AIRSPACE WITH COMPUTERS

THE main function of air traffic control is to maintain safe separation between aircraft and to expedite their passage. It entails much more than the popular conception of giving ground guidance to aircraft on their departure and arrival in terminal areas. Pilots can navigate accurately by ground-based radio beacons or self-contained doppler inertial systems, but the only airborne collision avoidance system in general use is the human eyeball Mk.1, which is of no help in cloud.

So the air traffic controller makes sure that aircraft in his particular sector of airspace are physically separated either by height, lateral distance, or time. The latter separation is carried out by taking pilots to report when they are passing over radio beacons.

Britain's airspace covers more than 144,000 square miles, extending well beyond the boundaries of territorial waters, and the majority of air traffic is concentrated on the south-east. As head of the province, Britain, as the agent of European control, a consortium of European ATC (air traffic control) organizations, is responsible for the inbound and outbound routing and separation of trans-Atlantic traffic.

At the moment, the majority of the work of the air traffic controller is carried out manually, using radar as an aid where it is available, but there are several schemes going ahead in Britain to use the high speed of computers to simplify the controller's task. The main reason why they have not been put into wide use before now is that not all aircraft have the necessary transponders installed which, after interrogation by a ground controller, sends back the aircraft's call sign and height together with normal radar positional information.

Before outlining the computer systems available, it will be useful to appreciate the basic needs of an air traffic control system. Aircraft navigate between airports via "airways"—ten-mile wide corridors of airspace which extend upwards from their bottom level of between two and six thousand feet to 25,000 feet. At intersections of airways, or at the boundaries of "terminal areas"—radio beacons are located. Terminal control areas surround each major airport and are designed to give sufficient manoeuvring space for both inbound and outbound traffic. All movements within the airways and terminal areas are controlled from the ground, and light aircraft without radio, and military aircraft, keep well clear. Above 25,000 feet is ULF airspace. The airways the airspace system has theoretically been abandoned in favour of an "area control" system. Where civil and military traffic mix freely together under positive control from point to point, airports, ATC centres. Eventually, the area control replaces the terminal airspace system.

The radar set automatically works on a "procedural" basis, with pilot-flying flights phase with ATC before taking off, giving arrival area, ATC-estimated time of departure aircraft priority. ATC-centric preferred cruising heights, routine and standard and estimated times of passing beacons on route. The flight plan is the basis of the procedural system, and is sent to the major centres involved together with the departure and destination airports.

Each ATC centre divides its airspace and routes into "sectors"—each under the control of one sector controller. When an aircraft passes through the area they are "handed over" from one sector controller to another. Thus, at the moment, is done by voice. As an aircraft takes off it calls the ATC centre and gives its actual time of take-off and its estimated time at the first reporting point. These times are then matched with the theoretical separation will be determined by the flight plan, and new algorithm. The points at which the pilot's call will originate from which point he will be able to cope. Once again this depends on the height of the aircraft at the point where it is crossing traffic. The flight plan is the basis of the flight. As the flight plan progresses, successively nearer bases, and, of course, efficiently different凤, as the weather changes, the route it will take. Each ATC centre then tries to keep the heights clear of other aircraft.

The system has been compared to a three-dimensional chess match, and if it were done solely on a procedural basis, the world would be like playing blindfold chess. In fact much of the blindfold element is eliminated by the use of radar which is now used for virtually all horizontal separation. In all cases, the only unknown factor, dependent on flying conditions, is the wind and turbulence. This indicates, and equally importantly, how accurate the altitudes are set.

In Britain, the use of computers in ATC is only just becoming commonplace. The ATC Experimental Unit at Horn has been evaluating various systems for a number of years, using an Elliott 4030 system, and a Ferranti Apollo has been active at Prestwick, working out tracks and heights for incoming and outgoing trans-Atlantic flights.

Because of increasing traffic in the London area, and as a result of a previous decision some years ago to form a joint ATC system in Britain, a completely new ATC system is being set up at West Drayton near Heathrow. Being developed in several stages, the ATC will eventually be fully automatic, using computers at almost every stage of the operation. Thus far, radar to display and control devices and computer-driven systems are now in use.

First stage in the automation of ATC in Britain has been the installation at the London ATCC, a strip printer (Ferranti Markle) which prints out flight progress trips for each aircraft on the computer that only looks up and around. The system's central processor is a Ferranti Hermes computer, which runs all the additional logic circuits to control the peripheral equipment input and output in via an IBM 7094 computer. The strip printer for aircraft data, for the strip, for the format data, which is supplied via tape punch and reader. Data is exchanged at the system's central processor the London ATCC, and the Farnborough data link.

Flight data (aircraft callign, (UTC, aircraft type, destination, route, etc.) are fed into the central processor from the report from the other control centers distant sources. Variables such as wind vectors and take-off direction are then fed in by the system that spreads from this information to the system's central processor the network of aircraft (which can also be automated) or the flight time predictions from the system, (the network between points or the ETA ATC), can then be made, based on the time of arrival), or both. Also determine the sequence of the strip, can then be modified, which can be printed. The strip paintings are then printed at the back of the appropriate sector controllers, which are fed in the same way as manually written strips have been used in the air—a mass of data and little progress strips, which are then fed back to controller to the aircraft passes through the various sectors. They are amended by hand.

The next stage in the semi-automatic system will be for the flight progress strips to be replaced by computer and printed using paper tape and electronic data displays. These displays will be digital and can be modified, which can be printed.
From Page Twelve

will be along the lines of the "Touchstone" system developed by the Royal Radar Establishment, Malvern, England, which demonstrates how a simple computer can be engineered on a display, by touching the appropriate wire which is inset into the face of the CRT in keyboard fashion. The ideas are variable, according to the program designer, as few as 10 resistors and capacitors are needed for the most complex computer memory.

In the "front-end" position, the display shows only the list of aircraft call signs which apply to the sector currently being displayed. The width of the display changes to the flight details for that aircraft. At the same time the wiring changes the "keyboard" symbolre to represent all of the tabular headings referring to the flight details. This enables the operator, for instance, to insert delete or alter any of the details referring to the flight. It may be early in the report point, or he may have told it to stop, in which case the details will need altering. In the latter case he will touch the wire representing "descending" and an appropriate command will be inserted above the aircraft's altitude. When he's ready, he'll touch the "altitude" wire, which will indicate the aircraft's height. He'll keep touching the wire to make sure it's kept up to date.

The system takes much longer to read and write about, than it does to comprehend when age at first glance. It should be a major step toward a more responsive, up to the minute, computerized traffic controller's system.

Primary radar, which was the controller's only control tool during the first few years after war, is being supplemented by secondary radar to bring about a "smarter" system. As an indicator of the progress being made, the display is being engineered on a series of flight controllers' CRT displays. The transmitter, receiver, which performs a variety of functions, is being engineered on a ground-mounted transmitter (inner-tractor) and back to the main aerial beam. The associated data processing equipment, which eliminates "blind" tracking of aircraft which are responding to signals from other transmitters, is contained in the controller and the latter, if the transponder and aircraft systems are capable, is transmitted from the antenna by digital techniques.

The 60-second surveillance radar equipment is in use at several major sites in the U.K. In a recent demonstration, a crystal-controlled interrogator and a small airborne receiver was put on the flight deck of a Royal Navy aircraft. The operator then picked up the controller and the aircraft was traced on the screen without the operator ever touching the control. The operator could then call up the display and a selection of the equipments could be made, such as the flight altitude, the airspeed, and the position of the transponder. The control process is essentially the same as that used in the control of an automobile, with the operator being able to choose the correct equipment at any time.

The system is designed to control the aircraft in a linear fashion, with a view to the future. It's designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made. The system is designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made. The system is designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made. The system is designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made. The system is designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made. The system is designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made. The system is designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made. The system is designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made. The system is designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made. The system is designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made. The system is designed to be able to handle any number of aircraft, up to a maximum of 10,000, and to transmit data to the controller's display in time for the control to be made.
COMPUTERS have been used in aircraft for longer than people think. For example, thirty years ago the Royal Air Force introduced one of the earliest airborne analogue computers — the Air Position Indicator (API), which accepted inputs of true air speed and heading and resolved these values into air position, i.e. the "zero-wind" position, of the aircraft. Even earlier, simple forms of analogue computers were used for bomb sights.

Later on, ground position indicators (GPIs) were introduced, although these had to wait until navigation aids were removed from the cockpit. They were of much value. The advent of digital navigation systems in the early nineteen sixties produced the first real GPIs, which employed the same principle as the API, i.e. a number of ball resolver, to compute the aircraft's true position using inputs of ground speed and track angle from the doppler and compass systems. Analogue computers of a similar type are still in use today with the majority of long-range civil operators and military forces, although they have evolved to much higher degrees of sophistication.

Until the last few years, all computers in aviation were of the analogue type and were used solely in the navigation function. However, manufacturers have long since realized the importance of computers to the operation of an aircraft and have directed much effort to an understanding of the advantages and limitations of both digital and analogue computers.

A Marconi AD 670 computer unit

By B. H. L. Blake
The Marconi Co Ltd

One thousand words are worth a picture.

We have put an end to sorting out masses of complicated computer output. By making a range of graphic plotters that actually draw pictures of the information you need. Further savings. Management charts. Statistical Analysis. Accountancy graphs. You name it, our colours can draw it.

We make two basic models, using 14" or 30" wide paper, which can be made to run on or off-line with your general purpose computers. Our larger model also has a 2 pen option.

If your company has a computer or is thinking of getting one, it would pay you to find out how our plotters can help you. Drop us a line and we'll send you details and demonstration arrangements.

Computer Instrumentation Limited.

School Lane, Chichester's Ford, Easingwold, Hampshire.
Telephone: Chichester's Ford 6771. Telex 47230.
AIRCRAFT COMPUTERS ARE NOT NEW

Proven the world over

The better electric paper-tape spooler from Data Efficiency, manufacturers of quality computer and data processing apparatuses.

6” MODEL: ideal for tapes up to 500 feet and only £14.50.
8” MODEL: has a boost switch providing extra torque for tapes over 525 feet. £18.00.

HUBS: will accept standord cores or can be provided with a slot for direct winding. Hubs must be made to order.

Full information of this and our many other products, including magnetic-tape spooling, from

Data Efficiency Ltd
Duxons Turn, Maylands Avenue
Hemel Hempstead, Herts, England
Telephone: 57137/8

COMPUTER DATA PREPARATION

Our highly trained punch-card service bureau will give you:

ACCURACY
FAST TURN-AROUND
COMPETITIVE PRICES
BATCH ORDER DELIVERY

Why not telephone us now for further details

We are equipped with I.B.M. and I.C.L. machines and have the capacity to deal with over 150,000 cards per week.

MINI-COMPUTERS IN AVIATION

There are many different computers and systems available to the operator's desk. Some are able to solve the problems experienced in the control of aircraft and many European operators are using them. It is significant that the first computer systems used were in the airline industry. The computer, as a recognition system, is now in widespread use in industry.

The development of the European 9 satellite launch is also related to the auto-pilot to give automatic steering to any chosen position. The computer is also being used in the Ariane, the Ariane, the Ariane, and to design the hairdryer of the Ariane system. The Ariane is a regency device designed to provide the Ariane, the Ariane, and the Ariane, and it is used in the Ariane, the Ariane, and the Ariane. It has an 18-bit word, which may represent a number or an instruction, and a 12-bit addressable memory, from 1024 to 10,336 words. The standard computer has a capacity of 8192 words.

The Ariane 900 is a redeveloped version of the Ariane 900 and incorporates the latest integrated circuit techniques to achieve high reliability. It has been designed to meet very stringent military requirements and in particular the Ariane 900 is used for navigation and communication. It is used to control the Ariane, the Ariane, and the Ariane. Each component is assembled to the requirements of the Ariane 900.

The term energy management is, in fact, the latest term for fuel management and control. It means taking all the computer's fuel in order to increase the overall performance of the engine. Fuel in the Ariane provides the pilot with a constant flow of information on the status of the engine. The computer, as a recognition system, is now in widespread use in industry.

The philosophy of the central computer is that the number of separate computers is reduced to a minimum of 12. The reason behind this is to provide maximum computing power with minimum requirements. The central computer is the heart of any computer system and must be regarded as a key component of the system. The central computer, in the Ariane, is the heart of any computer system and must be regarded as a key component of the system.

The Ariane computer is a very powerful device used in the Ariane, the Ariane, and the Ariane. It is designed to provide the Ariane, the Ariane, and the Ariane, and it is used in the Ariane, the Ariane, and the Ariane. It has an 18-bit word, which may represent a number or an instruction, and a 12-bit addressable memory, from 1024 to 10,336 words. The standard computer has a capacity of 8192 words.

The Ariane 900 is a redeveloped version of the Ariane 900 and incorporates the latest integrated circuit techniques to achieve high reliability. It has been designed to meet very stringent military requirements and in particular the Ariane 900 is used for navigation and communication. It is used to control the Ariane, the Ariane, and the Ariane. Each component is assembled to the requirements of the Ariane 900.
SOFTWARE PROBE BY BOAC

AN INVESTIGATION into the reported misuse of details of programming of the software of BOAC's Radatac total management project is being carried out by BOAC assisted by IBM. The airline say the investigation may lead to civil action.

What is involved is a mass of documents containing detailed analyses of the operation of the Radatac computer complex. They represent many years of work and an investment of at least £200,000.

The Radatac project has been joint BOAC and IBM venture and involves the IBM International Managed Airline Reservations System. While specifically dealing with the airline's reservations and management needs, the system is basically a broad-based real time control system.

As such it is applicable to a wide range of computing activities and could form the basis of a general purpose bureau system. The investigation is the first of its kind to come to public attention in the United States, though there have been similar cases in the United States.

The situation revolves around the theft of hundreds of the computer books. Systems and software information are at the moment, virtually completely unprotected both here and in the US communities have studied the security of systems in terms of both copy right and patents, but without such details have been reached.

Compact machine launched

INNOVATION not research is the big point in the computer industry, said Mr Ian Barrow, managing director of Computer Technology, yesterday when he announced the volume production of the Modular One system at the new Hemel Hempstead factory.

Says Barrow: "The statement was based on a recapitulation of Mr Barrow's arguments that while IBM may dominate the UK market, it is the smaller systems, such as SDS and DEC, that will get the development work and, it is upon them that Computer Technology modelled its philosophy, if not its product."

While Computer Technology had no official back-up, despite an early appeal for support pet to the NROE, the company still had the Minister's Dr Jeremy Bray as chief guest at the announcement ceremony.

FUTURE OF SFL IS ASSURED

The name of Modular One has been bandied around for a long time, but yesterday was the first time that any technical specification was produced. It is now revealed that the production model has a basic addition time of 1.5 microseconds, a multiplying time of 2.5 microseconds and division time of 4 microseconds.

More important, the basic design minimises changes and adds to facilities for program changes and responsive operation. This has, it is claimed, provided an improved performance in comparison to the previous computer. The company also strengthened its relationship with DEC and are now OEM customer rather than a simple agency, for CDC peripherals.

Opinion

PROTECTION NEEDED

The inquiry currently being carried by BOAC into the exploitation of systems information is potentially one of the most significant events in UK computing this year. It was inevitable that sooner or later a happening should come with the resulting possibility of considerable loss for the victim.

It might at least demonstrate the danger to the victim of the large difference between a computer and a computer applications system. More likely it will lead to a flurry of popular press stories about how such events can happen and a pointless debate about security and privacy.

The danger to the industry is general, and the con- sequences in particular, is the insatiable demand to their information for integrity: and this in turn relied on access to knowledge of other people's affairs in order to develop systems that will bring to their customers the greatest economic advantages.

The reputation of the industry has been badly hit, and as good as an industry in which staff is short and job pinching far from uncommon, one person has been involved as one consultant is reported to have said last week, to buy a major company and experience one thing - to buy the contents of his briefcase another.

At the root of the matter lies the fact that software in any form is virtually irreplaceable other than by clones in employers' contexts. Both bodies here and in the US have spent considerable time discussing software copyright protection to general acceptance, but not the whole scholor has been developed. One useful hidden of an unscrupulous user may yet be that the media experts may now be forced to take some positive action.

Visual

A SPECIAL supplement dealing with visual display terminals published with Computer Weekly's June 4 issue will be sold with the development of television, applications in the industrial, commercial, educational, scientific and military fields and a look at future equipment. Information on advertising in this supplement and of dead lines for copy may be obtained from the Advertising Manager.

WHEELEDON CALCULATING BUREAU

NEW STREET, BIRMINGHAM 2.
T. 021-443 6516

Our highly trained Computer Oper- ators specialise in Time Sharing, Collection and Distribution

WHY NOT TELEPHONE US FOR THE
e VERY EFFICIENT SERVICE

Hybrids for Shell Labs

THE largest system of its kind consists of two of CSF-500 hybrid micros designed through a high-speed, real 'intracode' interface to an SDS Sigma 7 computer. The hybrid has been installed by Redfin-Agrodata at a cost of £500,000 at the premises of Shell Research Laboratories in Amsterdam.

A team of Redfin-Agrodata analysts is currently engaged on designing and testing the software, which will use Shell's existing laboratory set-up and simulation and general chemical system. Initial expectation is for a 17% improvement in research costs.

H120 to speed-up overseas orders

ELECTRIC motor manufacturers, Newman & Vantre, Yate, Somerset, who export over 50% of their H120 series of 100kW electric motors, have installed a Honeywell 120 computer at a cost of £100,000.

Initial applications will include stock control, evaluation of component performance and the transfer of accounting procedures to the punched card system, later to extend to production control and design calculations.

Punching forget it data preparation

LIGHTNING FAST

Optical character recognition breaks through the data preparation bottleneck. Now you can have data prepared, checked and ready for use in a normal turn around time. You print a form and directly with guaranteed accuracy to magnetic tape in any specified computer code.

40% PLUS

40% PLUS

This range of services includes:

1 Computer bureau services.

2 Offline print out of computer files.

3 Paper tape to magnetic tape.

4 Magnetic tape to paper tape.

5 All tape formats 8, 9 and 8 plus Olivetti compatible.

SCANNING & DATA PREPARATION LTD.

MONARCH 1858 (6 lines)

FOR DETAILS APPLY TO:

FOR DETAILS APPLY TO:

SCANNING & DATA PREPARATION LTD.

MONARCH 1858 (6 lines)

FOR DETAILS APPLY TO:
ON-LINE USE FOR ELLIOT DISPLAY UNITS

COMMERCIAL quantities of a new family of alpha-numeric computer displays, with associated keyboard and light pen input facilities, are now being manufactured at Boreham Wood by Elliott-Automation. The family has been developed for on-line communication applications in all environments and includes units specially designed for use in military aircraft and armoured vehicles as well as commercial and industrial operations.

The new family, the Elliott Mk II Series 20, includes units with 8.5, 11, 17 and 24 inch screens, all of which are able to display information on up to 64 lines of 64 characters.

All offer a character repertoire of either 60 or 120 letters, figures and shapes, including lower case letters. The displays also offer facilities for showing double size character, extra bright characters or flashing signals for special purpose terminal.

Consistently the user has full communication capabilities with his computer, and the further addition of light pen facilities enables communications from the display to initiate further computed action.

In larger systems, consisting of one or more clusters of display units, the information may be integrated using a small computer — such as one of the Elliott 900 Series — which is directly interfaced to the main computer system.

Rotprint machines

A SERIES of offset printing and duplicating machines is to be manufactured in the United Kingdom by Rotprint (Bristol) Ltd, a new nationalisation, and will be marketed by the firm. The machines will be manufactured in Britain and the Rotprint claim that this will considerably reduce prices and also improve the quality which already represents a high proportion of their total manufacture.

Would they stand up to this?

Yes, if they were stored in the Remington Data Safe, the first insulated file designed exclusively for tape protection. Computer tapes are far more vulnerable than paper... the tape just melts away. Thousands of pounds worth of vital records can be destroyed in minutes.

The Remington Data Safe file is fitted with a specially designed tape storage mechanism. The file is dust-tight, and has a humidity-controlled environment to prevent physical damage to the tapes. It is designed to withstand a variety of conditions, including temperature, humidity, and mechanical shocks.

SFL's future

The development of SFL's future key technological systems which are not yet fully developed is also making progress. Using CDC page printers, mechanicals, and buffer designs, SFL are funding increasing applications such as OEM equipment, and as direct additions to existing systems. Development is also taking place on a 350 bpm printer designed with data transmission in view. A forthcoming OCR bureau using the CDC page reader with computer control to prepare data files directly to mag tape has also been established.
Next train at this platform is being watched by a computer.

Information on train movements from the timetable (yes there is a timetable, the trains don’t run at random), was punched on to a wide paper tape. When loaded into the program machine, the routes and signals could be set automatically if the train identity, set up by the driver before starting the run, matched that on the paper tape.

The system reads the train identity via the running rails, and should the train on the track not be the one anticipated, the program machine will set the points and signals in accordance with the timetable, and flag a warning to the signalman. This allows him to take corrective action and override the machine if necessary.

In the picture of the Victoria Line control panel, you will notice two schematic diagrams of the track layout. The upper one shows the state of the railway from the point of view of the program machines, and the lower the actual situation. In the event of a mismatch, the signalman (or regulator, as he is now known), can be at a glance where the trains are and decide on the measures that are to be taken.

The whole line has been automated by the use of program machines, it makes sense to do away with separate signal-boxes, and its outstanding features in central London. The District and Piccadilly Lines have such an installation, as do the Victoria and Northern Lines.

The latter centre is rather more sophisticated than the former. Yes, you’ve guessed – it uses computers. The centre and two 4065s reside in the control centre near Euston station. For security reasons its exact location cannot be revealed.

The machines are installed in a Friday cage to avoid any risk of electromagnetic interference.

“I don’t know if it’s needed,” says Jim Irwin, the man in charge. “But it was cheaper to install it before the machines came online than to find we needed it later.”

Besides, we won’t ever have to re-decorate the machine room.”

I had to admit that the gleaming steel walls were particularly attractive.

Irwin explained that the computer had been introduced when it was discovered that the two regulators supervising the Victoria Line began to run problems during morning and evening peak hours. The situation was perfectly workable under normal conditions, if a number of cancellations occurred during the rush hours, the amount of manual intervention and decision-making involved could put undue pressure on the regulators.

The main function of the computer is the monitoring of traffic on the Victoria and Northern Lines, with the aim of providing help in case of difficulties and give advice. For example, the system tells the regulator in charge of individual trains – such as where they are, how fast they are moving, the nearest 10 seconds – and supply the identities of all the Southbound trains due to arrive at Oxford Circus in the next ten minutes.

“ ‘In what condition is this train arriving’ data will be used to indicate to the control centre operators the situation of the train at the station and also at the depot or workshop so that the next train is given the first available slot.”

The situation is currently only at its first phase – monitoring and recording, providing information never previously available. But…

The computers know where all the trains are on the system, in the event of a total power failure, the machines can provide the least well-known location of everything on the track rather than “plotting each station” as now.

Other uses of the system in the first phase include the provision of YUDs in each station manager’s office, showing any significant gaps in the service.

The second phase of the project will extend to a centralisation of individual program machines with overall control of larger sections of the railway from the control centre. A pilot scheme is under way in the eastern end of the Piccadilly Line.

The third stage, regulation, will provide the biggest benefit, says Irwin. Trains will automatically run at even intervals, to pick up the most passengers possible and to avoid bunching – the common cause of delays at the com- mon Underground.

The computers will detect when there is a problem and then, in the event of a train in front of the situation worsening.

The longer the gap between trains, the more people arrive to board, causing further delay as they try to pack the trains into an already crowded train. Irwin believes that, with some computers, some trains will be deliberately held up by the system, the average passenger will receive a better service.

Although the Victoria Line can run unmanned trains, someone is still needed in the cab to cope with any emergencies, such as power failures. Passengers would have to be restrained from disembarking at will and possibly putting themselves in danger, for example, and power could not be restored until all passengers had been accounted for.

Other facilities available to operators include closed-circuit television allowing them to monitor each station. Microphones and loudspeakers permit two-way communication with station staff.

These facilities can often identify potential suicides before they stab themselves and make trains. Such incidents can also be selected and transmitted to control offices to prevent the use of such lines.

Communication costs are minimised by the simple expedient of installing a private network with the cables running down the tunnels – no British Telecom charges for this installation.

WRATH OF DUNGEON MASTER

ADVENTURE

FURTHER to the long-running correspondence concerning hints on the game of Adventure, you may be interested in the following letter:

Sir, There is a crack of thunder, a burst of light, and the dungeon master himself materialises beside you. You are, of course, shouted at and smote. I am the master of the dungeon. I am also the provider of information to anyone that will listen that none but the most scholarly people will be admitted into the secret realms of the dungeon, and that they meet the stringent requirements laid down by the great implementers themselves.

You have displayed us greatly. You have gone against the spirit of the dungeon. These are the Great Underground Empire of Zork. These lands of exploration and discovery were built at great expense (and at personal risk) by the great implementers (whom beware), to give pleasure and excitement to many brave adventurers throughout the many planes of the multiverse.

The place of information, each new treasure, each new room or experience, is to be a test, a challenge, a menace to the explorer. I myself have been created to test the wits and skill of the adventurers that dare to enter my domain but through many hundreds of studies and experiments, I was through the final treasure in the world of Adventure. With many more hours of study, I have achieved the rank of dungeon master, with a disapproving expression on his face, and moves his fingers in a complicated pattern in the air. He ^speak^s slowly, his voice is somber, his face remains expressionless. “From my privileged position in the halls of Zork, I am here to inform you that the full extent of the dungeon master’s (in all his many guises) is to observe and control the dungeon master. He loves to watch you suffer.”

He ^speak^s slowly, his voice is somber, his face remains expressionless. “From my privileged position in the halls of Zork, I am here to inform you that the full extent of the dungeon master’s (in all his many guises) is to observe and control the dungeon master. He loves to watch you suffer.”

The dungeon master works, with a disapproving expression on his face, and moves his fingers in a complicated pattern in the air. He ^speak^s slowly, his voice is somber, his face remains expressionless. “From my privileged position in the halls of Zork, I am here to inform you that the full extent of the dungeon master’s (in all his many guises) is to observe and control the dungeon master. He loves to watch you suffer.”

PETE PERRY

Bored! Good game! - AT
THE history of the Elliott 402, one of the first large computers, is one of startling, spontaneous success. It was the story of an idea that became a reality in less than eight years and then, like the story of many other computers, it took a detour, a detour that, for one who, over the years steadily climbs to a high and respected position on the computer industry's ladder, the 402 made its mark in the computer world.

So much so, that while many of the names we remember from the past, five of the six inventors of the 402 are still very much in existence, providing a valuable repository of knowledge to computer professionals. In a few cases they are operating side by side with the latest computer technology and although they are remote from these new computers as the earliest sailors are from today's transatlantics, they continue to meet these new challenges with a remarkable poise and confidence.

Back to 1936, the story of the development of computers is marked by a series of tentative forays by Elliott Brothers, an engine and machine tool firm of Great Britain. In 1942, the military defense contract was awarded to the Elliott Brothers to build a limited number of experimental on-line fire control systems. As late as the 152, this computer became operational under research and development.

A further Admilitary contract was awarded to Elliott for the improved machine designated 153. This was an immediate success and, although based on the 152, was built on a secret project and no one was aware of its existence until a few years ago when an article appeared in a November 1953 issue of Science. A second 153 was sold for use on John Bolt's work at the NASA's Jet Propulsion Laboratory. A third 153 was a member of the developmental team of the first commercially available computer, the Elliott 402. Elliott's Authorisation was given by the late Sir Countess Elliott, the purchase of the 153 which is described in the new text.

While the initial stages of the development of the computer that Mr Andew Si John. Bolt, who was to play an integral part in the building of the 402, spent months of work at a late stage in its development, the machine that had not been involved in the military project.

The contrary is in fact the case.

During 1940's work with Elliott, Bolt considered working on every project, except those which were sponsored by the British Computing Division, and climbed to the top of the company's management. At one point in time, the company's management did not have to decide whether to operate independent software house.

"Packaged" circuits

In 1952 Elliott's achievements in the development of the computer attracted the attention of the National Research and Development Corporation. This led to an agreement in which a general purpose computer was built on the basis of certain "packaged" circuits and was delivered to the company in 1953.

"Oil finding with computers—

that was the theme of a symposium in Dallas, Texas, when the American Association of Petroleum Geologists' 44th annual meeting included a Computers Section Symposium, writes a special correspondent.

Although major companies have been among the pioneers in the exploration of oil in the United States, the majority of petroleum geologists have not been able to use the computer as an experimental device. This is true of the computing systems which, typically require digital processing of handwritten magnetic tape information. The new machine has been designed for use with both digital and analog information.

Geophysicists have used computer programs to store some of the data that have been a recent history of data in the field of digital computer science. The computer can now analyze data in a very quick and reliable way. The computer performs a series analysis which allows a geophysicist to make a better prediction. The computer is one of the most important tools in the field of digital computer science.

Markov techniques

Graham Lee, a London based computer consultant, has shown how to use Markov models to analyze problems in geology. These models are especially useful because they allow a computer to make predictions based on a set of rules. The Markov model allows the analyst to make predictions based on past historical rules of the company and by competitive companies.

The forecasting model described relates the relation of an exponential distribution to be made with a computer. The model shows how the values are related to each other under conditions of finite risk rather than uncertainty. This case, the model provides an estimate for oil.

As a result of a conference on problems of oil exploration, the Stanford University's Dr John O. Hawkins, at a recent conference at the meeting of the American Association of Petroleum Geologists, said that more work is needed in this area.

A short series about early British computers

jobs which required up to 10,000 employees. Before the installation of the British Railways machines, however, the original 402 at Dewey Road spent many ordinary working overtime to keep pace with the ever increasing workload. During some of these occasions, left completely unattended, the 402 found itself solving problems fed into it the evening before, ready for scrutiny the following morning. The engineers working on the program had to be long and of the type that required operator intervention.

Nevertheless, the reliability of the 402 in a situation such as this was a measure of the reasons why Dewey Road has not yet parted with the 402 in favour of a more modern computer. Looking largely at the reasons why Dewey Road has not been provided with the machines, it is evident that even on fluctuations in the market.

Inevitably, the 402 at Dewey Road will be replaced eventually by the 402, but not until such time as the company's management decides that it has earned its reputation over the past decade.

"Data processing in oil exploration"

"Multivariate facies maps were made for two of the exploration projects, the first being a young fault basin near the City of Los Angeles. The second project was for the American Express Oil Company, a company that has been in the oil business for over 50 years. The maps show how geological en-

A new family of instruments known as "architectural clusters" has been developed. This family of instruments has been designed for use in oil exploration, where it is used to determine the composition of the earth's crust.

"Distance function" algorithms have been used in many different fields, including computer science, engineering, and geology. They are used to determine the shortest distance between two points in a space. The algorithms used in oil exploration are based on the distance function, which is used to determine the composition of the earth's crust.

"Subsurface geology" is the topic of the last talk by James Lewis of Houston. He showed how the digital plots generated by the computer can be used to explore the subsurface rock formations. This method provides a valuable tool for analyzing the geological formations and understanding their origin.
IN THE BEGINNING...

EMIDEC 2400s are still giving sterling service

IN 1955, under a National Research Development Council contract, the Computer Division of EMIDEC undertook to design a computer, the EMIDEC 2400, which was to be ahead of its time on completion. I want to try to describe what system design was like in those days 13 years ago.

My first impression, looking at the very rapid growth in the computer and semi-conductor industries over this span, is that it was a different and certainly harder, more exacting discipline than computer science. People knew how to multiply, some even knew how to integrate, but little was known about applications, and although these with vision were starting to imagine the scope of computer applications, and operating systems were unknown. Yet it was not confined to us alone, but was virtually worldwide.

I can remember having my desk virtually all the time as a computer on the publication of 1905. Imagine then trying to get a seat on the BT Murray's month's worth into a normal steno office. Thus, in one way, it was all much harder due to the real problem of designing for it. Yet, by reason of the same ignorance many solutions to problems were found, but the cause the problem is different. This

There was, for example, more or less one way of connecting a piece of wire to a pin, and one or two ways of making printed circuit images. A great single dudgeon was a lack of any design guidance, and checked. An enormous job which occupied 90% of our efforts.

To the absence of any reasonable knowledge about application, we got out of the way as we designed applications. Various people of the present-day mail-order firms and large stores

There was, for example, more or less one way of connecting a piece of wire to a pin, and one or two ways of making printed circuit images. A great single dudgeon was a lack of any design guidance, and checked. An enormous job which occupied 90% of our efforts.

In the absence of any reasonable knowledge about application, we got out of the way as we designed applications. Various people of the present-day mail-order firms and large stores

...a slm £2,375

for the Muldivo Digiputer, the multipurpose computer powerbase — in a desk.

Now and you know the figures — here are the facts.

The Muldivo Digiputer is a really sophisticated small computer. Ideal for applications in areas as diverse as science and stockbroking, the Digiputer meets the very great demand for a compact, inexpensive and easily operated machine. Anyone who can use a desk calculator can learn to program the Digiputer in minutes — no need for specialist programmers.

As a bonus feature, the Digiputer can be operated as an on-line computing device, gathering information from such external sources as digital voltmeters, and carrying out computations at the user's request.

If you already have a large computer, the Digiputer can very likely be used by taking the smaller scale version of the Digiputer's function.
Handling the fusion data

A series of intense research programmes for investigating the techniques required to produce a controlled nuclear fusion reaction is underway at the UKAEA's Culham laboratory. Seen here is the laboratory's 4.5-tonne vacuum experiment in progress.

All the Culham experiments use toroidal 'doughnut' rings to store very hot plasma. The experiment at left is a 28-tonne toroid, while the left over 400 tonnes. The toroid is built by the National Superconducting Toroidal Facility, Inc. in partnership with the National Science Foundation. The Culham experiments use toroidal 'doughnut' rings to store very hot plasma.

Culham laboratory scientists say that there is no great difficulty to be overcome to harness the power of nuclear fusion reactions, and that the data this is achieved really depends on how much money is provided to develop the appropriate hardware.

GLC to extend London traffic control system

As a further development of the GLC's London Traffic Control System, an additional 200 display intersections are to be controlled by next March, extending the area of the system outside the present conurbation boundary. The project is being funded by a line linking the main London railway terminal.

The system has been operating since mid-1972, following a pilot project covering 70 signals in West London, starting with 23 signals in the Baker Street and Marylebone area.

Computers for the system were supplied by Siemens under a £275,000 contract awarded in 1970 to two British tenders from Plessey and Elliott Traffic Automation (C&W, August 13, 1970).

Two Siemens 385 computers, one with 32K and the other with 48K of core, were installed in 1972 at the GLC's offices in County Hall.

The computers have now been moved to a new traffic control centre at New Scotland Yard, and the 32K 385

Boots install Datasmart

A SINGLE ion monitoring system is being installed at 1,000 shops across the country by Boots. The system incorporates an 8K DEC PDP-11/44, with two magnetic tape processors, as well as an ASI 3902 high-resolution mass spectrometer. The system is used to provide real-time monitoring of chemicals in the atmosphere, and the data is used for quality control and process improvement, so that the problems associated with high speed can be avoided.

Rising demand for DP/OR executives

In fifth place under personnel, sales and marketing; market research and production executives, data processing and systems researchers. Large research executives are still in demand, according to a European Executive Survey conducted by the Management Consultants Ltd.

For the first quarter of this year, the index for DP and OR executives was down 48 points on an equal quarter last year. This was reflected in a 92 per cent increase in demand for this quarter.

Interestingly, demand for overall market executives was down 36 per cent on the same quarter last year, with the index falling from 381 in the first quarter of last year to 61 this year.

Over Europe as a whole, only in Germany was the demand for DP and OR executives reduced, and there it was down by 74 per cent on the first quarter of last year.

In all other countries covered by the index, demand was up. In France, the index was up by 50 per cent; in Italy it was up by 117 per cent; Belgium, 43 per cent; Switzerland, 101 per cent; and Sweden, 197 per cent.

The demand for executives generally rose in the UK, with the index generally up by 10 per cent over the first quarter last year, and the index at 302, was the highest it has been in the UK since PA Management Consultants started monitoring demand in 1976.

In Italy, demand for executive generally rose by 11 per cent, the highest figure for any country covered, while general executive demand for Germany was only 34 per cent over the figure for the first quarter last year.

Another index, published by the European Information Services, measures the continuing analysis of advertise-ments for managerial and technical positions in the

Memorex launches floppy disc drive

A NEW OMP floppy disc drive, the 655 Flexible Disc Drive, has been announced by Memorex UK Ltd. It is an improved version of the 600 which was announced last year but was never strongly marketed.

The improvements include a faster track-to-track access time of 16 milliseconds, with 10 milliseconds search time. The average latency time is 180 milliseconds, and the transfer rate is from unit to unit, 250 bytes per second.

Another new factor is that the FDV extended line drive, giving a minimum life of 50 million passes, is now available.

Data can be written in either sector or side recording, using 132 byte records with 32 bytes per track (on 56 tracks), or 56 tracks (on 96 tracks), giving a maximum capacity of 512,500 bytes, or 2.5 million bits.

Applications envisaged include auxiliary storage, remote terminal data acquisition, data logging, key-entry recording, point-of-sale recording, accounting machine storage and programmable calculator storage. Other uses include as a micro-program loader in writable read-only memories, and as a diagnostic program loader.

ERA staff take over from ICL

AFTER five months of working under ICL Datakivision, the Edicec and control nuclear fusion processes as a means of generating power on a commercial scale is being carried out at the UKAEA's Culham laboratory. Seen here is the laboratory's 4.5-tonne vacuum experiment in progress.

All the Culham experiments use toroidal 'doughnut' rings to store very hot plasma, but the Exocet project stages further and uses a superconducting ring inside the toroid to generate part of the magnetic field required to contain the hot plasma.

When its superconducting current is induced, this ring, weighing 14.5 tons, can be held up in the surrounding magnetic field without any means of external support — hence the name Leviton.

Culham laboratory scientists say that there is no great difficulty to be overcome to harness the power of nuclear fusion reactions, and that the data this is achieved really depends on how much money is provided to develop the appropriate hardware.

IBM had secret task force

The anti-trust suit between IBM and Telex has continued with further hearings of witnesses for both sides. At the suit, in which Telex has claimed that IBM has a monopoly over external telephone peripherals, and that it has adopted marketing strategies which are tending to eliminate Telex as a viable competitor, started last month (C&W, May 3).

Edward Grant, Telex senior vice-president for product management, said that Telex sales dropped 4% per cent after IBM's introduction of its fixed term plan leasing notice. This made a reduction in prices essential, causing a loss of earnings on current products as well as on those in the development stage.

IBM attorney Thomas Burr countered this allegation by suggesting that the drop in sales was attributable to IBM's introduction of the Memorex disc, the 330. He cited installation where this had been a direct factor in Telex's loss of an order. Mr Grant replied that he only knew of two in the 330, and that his company had in the others mentioned he did not know what the reason was.

An important witness was Richard Whitehead, currently working for IBM after previous employment with IBM. He claimed that IBM formed a special secret task-force, of which he was a member, to analyze the success of the plug-and-play machine and to recommend policy changes to meet the challenge. The recommendations made included the policy of making slight product enhancements at periodic intervals after each launching, to keep the independents guessing and to make users worry, and the policy of reconfiguring products slightly so as to reduce the price drastically with out having an effect on the installed base.

Mask drawing made quicker

A METHOD of speeding up the production of drawings and the reverse process of circuit layout has been developed by the Mullard Research Laboratories at Horley. It is based on a special exposure device, which produces a paper tape from a data list which specifies the pattern in terms of a starting point followed by basic drawing elements of the required lengths and widths.

Before generating the paper tape, a vector drawing is prepared and checked which can be checked if necessary. The data is then made up and run through a numerically controlled drawing machine which draws the mask for subsequent photographic processing.
THE NAVIGATOR IS A COMPUTER

By Bernard Lowe Ferranti Ltd

February, 1968 eight flights were obtained during which the computer program was tested and refined. 76 hours operation al flying were recorded and several hundred hours flying switched off when suitable observation could not be arranged.

Occupying a 2½ ATR shell in the equipment bay the system comprises a standard 4096 word Argus 400A computer and power unit with a special input/output unit built up from standard circuit cards selected from the Argus MM range. The MM series consists of 43 different circuit cards developed to match all types of aircraft equipment. A modular design, with all cables and connections being met by varying the interconnection pattern, is used on the backboards. The configurations are changed by different cards supporting the computers. For BOAC, a total of 47 cards were used of 30 different types. One card was developed specifically for this project.

The computer is controlled by the pilot through a unique digital control and display unit which occupies only 5.35m² by 4.5m² of instrument panel area. The purpose of information transferable between man and machine per unit panel area is near the maximum for this type of construction. Comparable cockpit space utilization is only currently achieved with CRT type displays.

The selection of the displays and control functions for this major part of the system study refers to Fig. 1, the control panel contains the continuous information from independent data sources, 10 Air Data channels, and position data from a long range radio aid, VOR-DME and single VOR. The central panel of illuminated push buttons the pilot can select one navigation channel from the left hand side and one fix channel from the right hand side. The button lights remain lit to indicate current operating state. The difference windows displays the actual difference between the two derived positions measured in tenth of a nautical mile and the navigation channel can be updated by pressing the update button below the display. The light display plan as a series of waypoints. In Fig. 1, this does the INPUT switch to bin the aircraft position on the display and the ten push buttons as a key board. Types 0 to 9, which appear in the two digit code window. The INSERT button lights to indicate action required. The pilot presses INSERT (use CLEAR) and the light goes out. The INPUT switch is then turned to LAT/LON and the aircraft ramp position is entered. This time the digits appear in the upper display window, sequentially from the left, with the fifth and eleventh positions automatically showing characters W and eleven keypresses, having pushed button again lights and INSERT MM series typical interface unit display card.

or CLEAR can be selected after checking the correct value has been typed. Information is only acted upon by the computer when the location button is pressed.

Code 00 is reserved for present position which is identical with Code 01 when the aircraft is stationary on the ramp. Codes 02 to 14 can be identified in turn with a similar procedure to insert a flight plan of up to 14 stages before flight. During flight, key changes are automatic and on passing each waypoint, the computer detects the position reference for the appropriate code. Further way points can then be inserted automatically from 01 onwards. Way points can be inserted or altered at any time during the flight.

The computer calculates the great circle course from one waypoint to the next. Using position, information derived from the navigation and selected, position and distance outputs are prepared. When the INPUT switch is returned to zero, control of the upper display window is transferred to the READOUT switch and the keyboard becomes inactive. The digital output presentation can be selected from any one of three possible modes. These are, position, next waypoint, ETA, track, distance to go, speed, velocity, cross track error, and course error. The displays are automatic on cross track and heading information are output on 'off-course' or 'on the line', indicator and bank angle demand to make good the flight path are available for the system.

Displays of present position, distance to go and cross track error derived from the selected information channel can also be obtained. This is achieved by deactivating the lighted navigation button. The light goes out leaving the selected light to indicate the change of display function. Normal operation is resumed by reselecting the navigation channel in the usual way. As a safety precaution, navigation button selections.

The navigator is a computer which...
From Page Sixteen

When flying a sequential flight plan, if the 50 NM lights are not on, progress is shown by displaying the next waypoint on the flight plan. An attempt is made to approach a waypoint at a range of 20 NM and if the autopilot is coupled the approach will automatically turn on to the next leg shortly after the start of the turn. The start of the turn is marked by a visual cue on the right side of the cockpit, and the computer is automatically replaced immediately by the next leg by pressing the LEG CHANGE button, followed by INSERT.

If a diversion is selected, distance track and ETA to the diversion point can be obtained. If the diversion point is not one of the 60 grid points already stored in the computer's position memory, the pilot must first be able to identify a spare code number, the procedure being the same as for flight plan waypoint identification. The INPUT switch is then turned to DEST S/P and the required code number typed into the code window. Leaving the INPUT switch at DEST S/P and the latitude and longitude associated with the code can be checked with the READOUT switch at FIX. Position, distance track and ETA are calculated from the new selected position and a number of alternatives can be examined in the same way without any effect on the flight plan. Diversion is, however, determined by a simple system of tracking the actual course of flight. If the course changes, it is evident that the flight is deviating from the planned course and an alarm is sounded. The alarm is cancelled by pressing the SELECT button.

For automatic updating of present position during flight an overhead light is used to indicate the correctness of the system. The flight plan is continuously checked and the computer will automatically correct any discrepancies. The control display is also continuously updated, with due allowance being made for any malfunctions that may occur.

From Data Sciences International

Progressive management tackles today's problems with the aid of a computer. But you don't have to own a computer to be competitive. All you have to do is call Data Sciences International. If you provide the questions, Data Sciences International's computer provides the answers. And with their new system you can now have a direct link with the heart of a computer. It's not further away than your office terminal. Feed in your questions and in a very few seconds later, type in the answers ... at your location.

Our computer is Your computer.

Argus 400 computer

Computers are good at control and cost-effectiveness criteria are relative. Did anybody mention the word autopilot - and omit it?

Rent a Brain

from Data Sciences International Ltd.

Branches:
Northern Computer Bureaux Ltd.,
21 The Calls, Leeds, 2.
Telephone: 0532 325523
Manchester Computer Centre Ltd.
P.O. Box 474, Spring Gardens, Manchester, 4.
Telephone: 061 834 0116

Data Sciences Ltd.,
56 North Road, Hampstead, London, NW3.
Telephone: 0171 252 2239

The Argus 400 computer was the first to be used for flight automation. It was developed by Data Sciences International, a company that specialized in the design and implementation of computer-based systems for various industries, including aviation. The Argus 400 was used for both flight planning and in-flight navigation, providing pilots with real-time information to help them make informed decisions during their flights. The computer was designed to be user-friendly and to be able to process large amounts of data quickly, allowing it to provide pilots with essential information such as weather forecasts, fuel consumption, and navigation data. The Argus 400 was also used in the development of flight automation systems, which helped to improve safety and efficiency in the aviation industry. It is important to note that the Argus 400 was used in conjunction with other technologies and systems to provide pilots with the most accurate information possible. The Argus 400 was a significant milestone in the advancement of flight automation technology and its use helped to pave the way for even more advanced systems in the future.
Special report
on Olivetti

Numerical control division
— one of the company’s fastest growing sectors

WITH an average annual growth rate of 18 per cent, the numerical control division of the Italian company, Olivetti, is one of its fastest growing sectors, and it is now outstripping the data processing side. Yet it is still one of the smaller operations, accounting for not more than five per cent of Olivetti’s turnover in 1969.

The division was formed in 1960 on the basis of considerable experience, particularly in the field of machine tools, and it was decided to start selling them outside the parent company in 1966. 150 machines were sold.

Today production, which is closely related to orders received, is at over 50 machines per month, and the division is represented in 31 countries. Approximately half of all the machines sold are exports (as compared with 10 per cent in 1965), and the rate is expected to stabilise within the next two years at 60-70 per cent of the market. The US is the biggest USA market, with the company receiving orders from Germany running second.

The N.C. division’s products include two machining centres — the Atrio, a vertical spindle machine which comes in both two and three spindle versions, and has three axes control, and the option of a fourth by adding a rotary table, and the Horizon, a four-axis horizontal machine with automatic tool change and a magazine capacity of 30 tools (the Atrio multiples have 12).

All the machine tools are driven by punched paper tape fed through one or two control units — the CNZ, which combines numerical and co-ordinate linear tapers and the more comprehensive CNDN which controls four axes with the capability of switching on a fifth. It incorporates a buffer feature to allow the execution of profiles and continuous surfaces without intermediate tool stops, and allows machining with linear interpolation on any one of the three co-ordinate planes.

Both machines also handle auxiliary functions controlling spindle speed, tool selection and coolant and other functions such as a simple gripping facility, as well as blocking and unblocking tools on the machine. They are available in a wide range of models, from the smallest to the largest, with a variety of standard and optional equipment.

Programs written in OPTAL may be run on either an IBM 1130 or a 360 machine and need only a minimum 8K core and a disc. On this is stored the tool library, materials library and similar repetitive data on which the ease and flexibility of the language is based. By linking the computer with a plotter it is possible to create graphic representations of the program — a useful aid for the engineer in the pre-design stage of tooling.

In addition to the two major divisions, the company also manufactures a number of other products, including calculators, typewriters, and a range of office equipment.
IN THE BEGINNING... PEGASUS—A PIONEER
IN RELIABILITY
AND EASE OF USE

TO appreciate the Ferranti Pegasus computer as an achievement it is really necessary to put oneself in the position of a typical computer programmer in the mid-1950s. At that time, the principal machines in this country were the EDAC at Cambridge, the EDSAC and EDSAC I at Manchester, and elsewhere the Ferranti Mark I and Mark I* machines.

In addition to these pioneers there was a medium-sized drum machine in existence—the Elliott 401. Reliable core storage had not yet been developed and indeed reliability of control processor hardware itself left a great deal to be desired. There were also the Ferranti Mark I and Mark I* machines, and these were designed for production and it was therefore realized at an early stage that in order to get the best out of these machines and to make the best use of them, a programming staff would have to be set up which had finished programs without the joy of this extraordinary intellectual exercise.

Against this background, the Pegasus computer was developed by Ferranti Ltd, for the National Research Development Corp. To design by a programmer for programmers, it was aimed to be the programmer’s assistant as much as the computer itself. The basic concept was to provide a machine with the ability to perform any logical or other function that the programmer or programmer were able to specify in terms of instructions or programs. This concept was a radical departure from the existing machines, and was based on the idea that the machine itself was only a tool and should be used to aid the programmer rather than be a major burden on him.

The Pegasus computer was a major achievement of its time, and its development was a significant milestone in the history of computing. It was the first machine to be designed specifically for programmers, and it revolutionized the way that programming was done. It was also one of the first machines to use the concept of stored programs, which is the basis of modern computers.

Muldivo's new computer has a very attractive figure...

Muldivo ltd.
84 ST BIZER STREET, LONDON, E.C.1. TELEPHONE: 01-231-7917.
or your nearest Muldivo Area Office.

A short series about early British computers

IN THE BEGINNING... PEGASUS—A PIONEER
IN RELIABILITY
AND EASE OF USE

TO appreciate the Ferranti Pegasus computer as an achievement it is really necessary to put oneself in the position of a typical computer programmer in the mid-1950s. At that time, the principal machines in this country were the EDAC at Cambridge, the EDSAC and EDSAC I at Manchester, and elsewhere the Ferranti Mark I and Mark I* machines.

In addition to these pioneers there was a medium-sized drum machine in existence—the Elliott 401. Reliable core storage had not yet been developed and indeed reliability of control processor hardware itself left a great deal to be desired. There were also the Ferranti Mark I and Mark I* machines, and these were designed for production and it was therefore realized at an early stage that in order to get the best out of these machines and to make the best use of them, a programming staff would have to be set up which had finished programs without the joy of this extraordinary intellectual exercise.

Against this background, the Pegasus computer was developed by Ferranti Ltd, for the National Research Development Corp. To design by a programmer for programmers, it was aimed to be the programmer’s assistant as much as the computer itself. The basic concept was to provide a machine with the ability to perform any logical or other function that the programmer or programmer were able to specify in terms of instructions or programs. This concept was a radical departure from the existing machines, and was based on the idea that the machine itself was only a tool and should be used to aid the programmer rather than be a major burden on him.

The Pegasus computer was a major achievement of its time, and its development was a significant milestone in the history of computing. It was the first machine to be designed specifically for programmers, and it revolutionized the way that programming was done. It was also one of the first machines to use the concept of stored programs, which is the basis of modern computers.

Muldivo's new computer has a very attractive figure...

Muldivo ltd.
84 ST BIZER STREET, LONDON, E.C.1. TELEPHONE: 01-231-7917.
or your nearest Muldivo Area Office.

A short series about early British computers

IN THE BEGINNING... PEGASUS—A PIONEER
IN RELIABILITY
AND EASE OF USE

TO appreciate the Ferranti Pegasus computer as an achievement it is really necessary to put oneself in the position of a typical computer programmer in the mid-1950s. At that time, the principal machines in this country were the EDAC at Cambridge, the EDSAC and EDSAC I at Manchester, and elsewhere the Ferranti Mark I and Mark I* machines.

In addition to these pioneers there was a medium-sized drum machine in existence—the Elliott 401. Reliable core storage had not yet been developed and indeed reliability of control processor hardware itself left a great deal to be desired. There were also the Ferranti Mark I and Mark I* machines, and these were designed for production and it was therefore realized at an early stage that in order to get the best out of these machines and to make the best use of them, a programming staff would have to be set up which had finished programs without the joy of this extraordinary intellectual exercise.

Against this background, the Pegasus computer was developed by Ferranti Ltd, for the National Research Development Corp. To design by a programmer for programmers, it was aimed to be the programmer’s assistant as much as the computer itself. The basic concept was to provide a machine with the ability to perform any logical or other function that the programmer or programmer were able to specify in terms of instructions or programs. This concept was a radical departure from the existing machines, and was based on the idea that the machine itself was only a tool and should be used to aid the programmer rather than be a major burden on him.

The Pegasus computer was a major achievement of its time, and its development was a significant milestone in the history of computing. It was the first machine to be designed specifically for programmers, and it revolutionized the way that programming was done. It was also one of the first machines to use the concept of stored programs, which is the basis of modern computers.

Muldivo's new computer has a very attractive figure...

Muldivo ltd.
84 ST BIZER STREET, LONDON, E.C.1. TELEPHONE: 01-231-7917.
or your nearest Muldivo Area Office.
Micro-controlled car route planner
developed by VW

VOLKSWAGEN is developing a number of microprocessor-controlled applications for onboard car instrumentation. The most interesting is USA, a German acronym for Driver Guidance and Information System.

The visible part is a small console mounted on the dashboard where the driver can easily consult it at speed (see picture). The console comprises an extended numeric keypad, a single line numeric display, and a graphic display, all controlled by a microprocessor and memory within the console box.

At the start of the journey, the driver keys in the destination code of the town or village to which he is traveling; this will have been obtained from a map or guidebook. The display then confirms the code that the microprocessor has stored.

As the journey progresses, the car passes occasional sensor gables in the road. Each microprocessor transmits to the car's destination code and receives in return coded information on the fastest and least congested route for getting there. The car transmits these into a simplified mapping which will guide the driver when and where to turn.

The roadside sensor cables are wire connected online to a traffic control computer system, into which the police, traffic officers, and other national traffic bottlenecks. The computer uses this and the destination code, plus coded traffic dis
tribution patterns, to vary routing advice given to the driver.

An experimental area of six interconnected motorways and main roads in the Ruhr has been equipped with sensors by Volkswagen in association with Ingenieurbüro Heinrich and Böselendt under a contract from the West German Ministry for Research and Technology. The system will continue until the end of 1989.

LSA can be extended to control the car's fuel supply on the outboard radar system signalling obstacles ahead. Provide information on speed restrictions received from roadside sensors and give the driver the instructions on optimum cruising speed. LISA will automatically regulate the cruising speed to conform to safe spacing and official speed restrictions.

Another application developed by Volkswagen is the DLS digital riding Stabilizer. It maintains real time control of the fuel-mixture into an idle engine so as to keep it just tickling in without stalling. The finer adjustments made by the microprocessor ensure that much less fuel is consumed.

THE first major strike in the computer industry occasioned by President Carter's anti-inflationary guidelines has hit Univac's Twin Cities plant at Minneapolis-St Paul.

The plant is the sole source of Univac's 1100 series CPUs, and 2,700 electronic technicians went on strike demanding an increase of 10% plus a fringe benefits package bringing the total to between 13 and 14%.

If we have struck due to the oil crisis, says one.

If there's going to be a mess on the line Analysis II will spot it

S. Africa growth plan

Eamond Frank reports from Johannesburg

THE results of the latest survey of the South African computer industry by the Department of Statistics in Pretoria suggest that the country's installed computer base should be worth R1,783.43 by the end of 1989.

The survey shows that the value of the country's installed computer base grew at a compounded annual rate of 15%, from R1,747,450 to R7,878,439 between June 1975 and June 1977. The estimated figure is not yet available.

John Starkey, ICL's managing director in South Africa, says the growth rate, which has been maintained at between 30 and 35% a year over the last five staff also helped to aggravate what it categorises as "internal problems".

As in previous years, the most serious of these was again "incorrect programming schedules. It was followed in order of importance by installation costs, programming backlogs, and hardware and software coordination problems.

Nasis, which surveys DP industry, estimates that 90%% of all major company projects in the country in the last year are currently behind schedule.

This year, the survey will include a separate study of the implementation of the new 1100/40 and the 1100/60 systems, as well as the 1100/25.

The picture above shows that lines of communication are not always trouble-free. Data travelling along telephone lines is as likely to run into difficulty. That's where Analysis II comes in. The network control system watches over the line, the modems and the terminals - to spot faults quickly, and warn the operator.

Analysis II is simple to operate, and inexpensive to install.

Who knows? It could pay for itself in the few minutes of use.

Find out more. Talk to CASE.
REMOTE LOADING AT OIL DEPOT

THF: the first remote-controlled rail car filling system in Britain has gone into operation at the Shell refinery at Stanlow, Cheshire. The system was developed by Shell in collaboration with Avery Bellot and Sperry Gyroscope. The data handling system and a new control room built above the filling point has been supplied by Sperry. It includes the dispatcher's input consoles and digital data circuitry necessary to accept the different inputs, a magnetic drum store and point-out facilities. To operate the system, the dispatcher has been inducted into a control box from where he receives information from the day's loading schedule, including customer code number, train code, rail car number and grade of fuel. Once the fill arm has been inserted into the wagon the dispatcher can receive information on the number of gallons delivered, total gallons delivered and the number of gallons loaded is recorded in an Avery Bellot meter. All this and other information is transmitted by Sperry's new equipment. The drum store retains all input information, which is used to prepare consignment notes. Number of cars and train weights are automatically recorded to be passed to the radio.

A punched tape output is available for subsequent processing by Shell's computer system. Overall, the new facilities provide a general view of the overhead control room, and since the large computer console the operator can control four loading points, two on each of the tracks which run beneath him. The computer's main functions are for inserting wagon number, train code and number of gallons and customer code.

CEIR extend data services

DATA preparation facilities, previewers and computer terminals of the CEIR computer bureau, have been augmented by CEIR giving a general card punch and verifying service.

The data preparation service computer is controlled from keypunching and verifying section, backed up by a range of equipment including sorters, collators, and tape-to-tape converters.

Computers' computers, on round, round, quality of the source documents, density of punching per card, and quantity.

A.C.T. COMPUTER CENTRE

1901 COMPUTER TIME

DAYTIME £12 EVENING £10
WEEK-END £8
ALL RATES HOURLY

16384 WDS CORE STORE 6420 KMc PAPER TAPES READER 600 LBM

PRINTING WORKING SPACE PROVIDED

A.C.T. 66-68 HAGLEY RD. BIRMINGHAM 1-254 8179

TELEPRINTERS

PERFORMERS REPERFORMERS

TAPE READERS EDITING and COMPARATOR SETS

2-5-6-7-8 TRACK EQUIPMENT

W. BATEY & CO. GAYTTS WORKS AYKEMAN SL TNG HERTS

TELEPHONE 3902B STD. OHIO 362 TEL: BUSI AND BACK. BATEY TRING CABLES: BAHNO TRING

STATISTICS show trend of computing in UK

STATISTICALS produced by the Ministry of Technology in their first quarterly review of the UK computer market, show that 1,388 computers were installed in 1966. A closer examination shows that more than a third of these, 383, were valued at less than £20,000, and were of the desk calculator type. The figures cover all machines installed, whether made in the UK or imported. Control equipment computers and other machines are listed, but computers in radar and missile systems are not included.

A total of 26 machines, costing more than £100,000, were installed, half of them being imported. In the £50,000-£119,000 price bracket the figure is 83, of which 29 were imported.

In lower price groups, £20,000 to £49,000, home manufacturers led the way with 51 machines installed out of a total of 107. It is estimated that at least 153 analogue or hybrid systems were manufactured with about 25 being exported. Total value of these systems was £1,393,000 with an estimated average value as low as £7,000.

Of the 10 major industrial-on-line systems identified, worth over £4 million, due to the wide field covered by this classification the figures are not complete. Taking a closer look at the whole field, and future figures may be compiled on a different basis.

Data transmission

Deliveries of terminal equipment for data transmission were apparently low, with a total value of £1.5 million, but they are expected to increase sharply as systems using data links are developed.

Expenditure on computer peripherals equipment not included as part of complete systems, totalled £101.010,000, and exports were worth about half as much again at £51.244 million. Of this, £1.010,000 was exported, showing a deficit of £1.010,000.

As well as covering installed equipment the statistics also deal with expenditure on repair and maintenance. The figures include works on installation which have been purchased outright rather than rented. In the latter case the maintenance figure is usually included in the rental charge.

Using this basis, the expenditure in the UK on such services was £3.904 million.

Research and development work carried out on behalf of customers comes to the surprisingly low figure of £380,000 of which only £124,000 is for software development. The figures, however, do not include certain well known government contracts, nor do they include the many contracts for software placed directly by users with consultants.

Orders for computers and peripheral equipment in the third and fourth quarters of 1965 were valued at £414.2 million, for the home market and £29.9 million for the export market. A total of 37 firms in the industry co-operated in the inquiry which will continue to be carried out on a quarterly basis.

WILSON AT THE NCC

From front page there had been successful collaboration with users on special purpose systems particularly in distribution, catering, construction—co-operation with the little Ned.

On NCC membership Mr Wilson said that the figure had now reached 290, and a spokesman for the NCC subsequently told Computer Weekly that this was made up of 54 manufacturers, 43 individual users, 130 commercial users, 17 consultants and various independent technical, professional and scientific bodies. At the laboratory the Prime Minister was introduced to NCC council members and shown the installation by two of the centre's consultants—Mr B. Toler and Mr R. MacQuaker.

A number of programs were run to demonstrate network planning for construction of a concrete building and traffic flow analysis for Worcester City Council.

WINSFORD RECRUITING

WITH production at its new factory at Winsford, Cheshire, scheduled to start early this summer, a junior personnel officer, recently appointed by the Recruiters has been by English Launch, will be aiming at engineering, technical, skilled and semi-skilled job-titles and a wide range of production workers.

Certain key workers will be transferred from the present factory at Kidsgrove, Staffs, and the provision of the new factory will be recruited in the Liverpool and Manchester areas.

New staff from Liverpool will be able to move immediately into the new factory, and a substantial proportion of those from Manchester will be employed at Winsford on an over-all pay scale about 20 per cent above the median.

Exported

AN £18,000 fee formulation company British designed and British made at the Burgess Hill plant of Associated Electrical Industries Ltd, has been exported to the Webster Co of New York, Massachusetts. The company is thought to be the first special-purpose analog-digital computer to be exported to the US. The computer is designed specifically for determining heating and cooling system performance for animal feeds.

LIGHTNING HATE

THREE computers at ICT's Bridge House South, Putney, were brought to a standstill last Sunday by a bolt of lightning which struck building being struck by lightning which damage was done to the building but the computers were in operation again after a short delay.

The application will be an advanced production control system.

The new factory will be able to move immediately into the new factory, and a substantial proportion of those from Manchester will be employed at Winsford on an over-all pay scale about 20 per cent above the median.

Lightning strike

THREE computers at ICT's Bridge House South, Putney, were brought to a standstill last Sunday by a bolt of lightning which struck building being struck by lightning which damage was done to the building but the computers were in operation again after a short delay.

The application will be an advanced production control system.

The new factory will be able to move immediately into the new factory, and a substantial proportion of those from Manchester will be employed at Winsford on an over-all pay scale about 20 per cent above the median.

Lightning strike

THREE computers at ICT's Bridge House South, Putney, were brought to a standstill last Sunday by a bolt of lightning which struck building being struck by lightning which damage was done to the building but the computers were in operation again after a short delay.

The application will be an advanced production control system.
SYNTHETIC AIRCRAFT SIGNAL GENERATION

BECAUSE traffic is increasing constantly both numerically and in terms of speed, control systems are constantly changing. Any change from a well-tried system involves a risk unless the new system has been thoroughly tested before being put into operation.

This major controlling authority has its own substantial experimental centre, fully equipped to generate synthetic aircraft signals of an almost infinitely varied type and to process these signals through a full-scale experimental ATC system so that its efficiency, safety and controllability are improved or can be established.

The installation is in Bréagly, south of Paris, where Eurocontrol’s experimental system has been operational for more than two years, evaluating systems and techniques which will be put to use at Eurocontrol’s control centres throughout Europe. The first is now being built at Maastricht, Holland. Capacity of the simulator is 60 and 300 aircraft operating in an 800-km2 area of 36,000 square miles, controlled from 40 positions.

The main contractors are CSF (France), Telefunken (Germany), and Plessey. The main computer is a Telefunken TR 4. This is a general purpose binary parallel machine of the one address type: Word length is 16 bits including four bits for checking and word identification. Thematically it can take up to 296 instructions, although only some 230 are in use. A ferrite core index store is used, plus an erasable ferrite core working store and a wired special ferrite store for permanent internal programs. Six input/output channels can operate simultaneously and independently of each other, and each has input/output devices of different operating speeds can be linked to each input/output channel. The devices can include punched card readers and punches, high-speed paper printers and magnetic tape units. Priority control, program interruption facilities and an internal distribution program allow the simultaneous operation of up to eight interlaced programs simultaneously.

Standard peripheral units consist of magnetic tape units made by Telefunken (Type MDS 251 AR), one tape punch card read-punch unit (IBM 4032), and one on-line high-speed printer (Anes). The computer is the heart of the system which processes the data from 300 synthetic aircraft tracks and provides them voltometrically to radar operators on the type of equipment which will be in use in radar centres of one PPV. Both equipment and procedures can be evaluated at Bréagly — one reason why the TR 4 has so many different kinds of input/output facilities.

In addition the system can be used for the large-scale training of air traffic controllers in an extremely realistic environment which can be slowed down.

The final approach during AN data is evaluated on a screen. The flight control panel, with the "prince," is shown. The "land" position is visible on the console next to the pilots.

Anyone who buys 6 automatic typewriters instead of one MSP 50 serial printer needs his bank balance examining — It's £2000 down

The MSP 50 Mk II serial printer meets the need for faster off-line handling of data from paper tape inputs. The operational speed of 50 character per second is 5 to 6 times faster than most automatic typewriters on a 132-column line with a 64-character set.

The use of standard inter-changeable printed circuit boards and a new photo-electric stereoscope system makes the electronic and mechanical functions of the printer easy to maintain and highly reliable.

Input codes can be changed and a multi-code system can be provided.

A wide range of optional extras is available, ranging from a simulated tabular feature to interlinking with magnetic tape decks or on-line terminals. Realistically priced from £4,000. Full data is freely available on request.

EMC Data Processing
Willo Lane, Macclesfield
Surry CR4 4UX

Machair
One of the EMC group of companies.
Continuous stationery supplement

ON June 1 a special supplement covering the growth and development of the continuous stationery industry is to be published with Computer Weekly.

Features will deal with the techniques and machines used to prepare and handle the specialised stationery needed for computer installations and there will be an index of companies in the industry and their products.

Any company wishing to be included in the supplement or requiring advertising space should contact the Editor or the Advertising Manager at Computer Weekly, Dorton House, Stamford Street, London, S.E.1.

THE LATEST DATE FOR ALL COPY IS WEDNESDAY, MAY 17.

ICT 1900 ORDERS TOP £1m

ORDERS for ICT 1900 computers have reached £100 million, a major achievement for British industry. Seven hundred and fifty 1900s, a third of them for export, have been ordered since October, 1964, when the first series was announced.

British in concept, design and production, the series is the only non-American full-computer range in the world.

Success of the ICT 1900 series, of which 350 machines are installed around the world, has been due to three main factors: the design of reliable hardware; the availability, on time of the wide range of software necessary for economic and efficient use of the equipment; and the existence within ICT of a sales force capable of understanding the data processing and scientific needs of industry, commerce and government.

Twin ARCH 102s

This installation, the order is worth £200,000, will replace two IBM 1440 computers which have been in service in IBM's London Data Centre since 1964. The System 1450 will be connected to the 1440 as a terminal, its data to be converted by the 1440 for delivery to the mainframe at the end of 1967.

The System 1450 will be used for production control, stock control, payroll and other work for the two mills.

The System 1450 will be the data processor for both the mills, and the 1410 will act as the input-output unit for the main machine.

H120 FOR ELI LILLY PLANT

ONE of the leading manufacturers of ethical pharmaceutical products in Britain, Eli Lilly and Co, have ordered a Honeywell H120 computer for their Basingstoke plant. It will replace a punched card installation.

In November and December remote on-line printers in ware-houses in Cheshunt and Wilshire will be linked into the system. This will be another commercial first for Tescos.

The complete system will have two eight million character drums and four 20K memory magnetic tapes. Most critical of its tasks will be the day-to-day shelf allocation of goods throughout the group.

In addition the computer will handle all payroll work, and budget controls and suppliers for 600 branches.

THE £250,000 Solution analogue computer, one of the largest in the U.K. has been moved from the Burrell building of the Science Bookshop at Bury St. Edmunds, and now in operation at its new home in the nearby Research and Development Centre. Here the first half of the machine, which was moved during one week-end, is seen on-line again after only a few days. The rest of the machine was relocated the next week-end and the whole complex is now back on day. The computer, purchased at Ministry of Technology expense, is used extensively on guided weapon work, particularly for Sea Dart for which Speyer provide the control system. Installations Ltd. of Ealing, was responsible for the move.

This is Britain's most modern grape-vine

Now a few encouraging words about it

When information flows through our grape-vine it is carefully filtered and speeded up to ensure that the system is effective in all parts of the country.

This is why we call it Britain's most modern grape-vine. To be more precise, the new 444 Telephone.

For the first time in Britain, the 444 telephone system allows operators to give out-up-to-date information. The new 444 telephone system gives the public a new service in a modern and efficient way.

The 444 telephone system is designed to answer the needs of the modern city, with its fast pace and its need for efficient communication. It provides an easy way to get information quickly and accurately.

The 444 telephone system is a completely new system, designed specifically for urban areas. It is based on the latest technology and provides a high level of service. It is also flexible, allowing for changes in the way it is used as needs change.

With a 444 telephone system, you can:

- Increase your business efficiency, whether you have two locations or two hundred.
- Get information quickly and accurately.
- Improve your communication with customers and colleagues.
- Enhance your organisation's image as a modern and efficient operation.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

In conclusion, the 444 telephone system is the perfect solution for any organisation that wants to improve its communication and efficiency. It provides a high level of service, flexibility, and future-proofing.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

In conclusion, the 444 telephone system is the perfect solution for any organisation that wants to improve its communication and efficiency. It provides a high level of service, flexibility, and future-proofing.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

In conclusion, the 444 telephone system is the perfect solution for any organisation that wants to improve its communication and efficiency. It provides a high level of service, flexibility, and future-proofing.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

In conclusion, the 444 telephone system is the perfect solution for any organisation that wants to improve its communication and efficiency. It provides a high level of service, flexibility, and future-proofing.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

In conclusion, the 444 telephone system is the perfect solution for any organisation that wants to improve its communication and efficiency. It provides a high level of service, flexibility, and future-proofing.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

In conclusion, the 444 telephone system is the perfect solution for any organisation that wants to improve its communication and efficiency. It provides a high level of service, flexibility, and future-proofing.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

In conclusion, the 444 telephone system is the perfect solution for any organisation that wants to improve its communication and efficiency. It provides a high level of service, flexibility, and future-proofing.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

In conclusion, the 444 telephone system is the perfect solution for any organisation that wants to improve its communication and efficiency. It provides a high level of service, flexibility, and future-proofing.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

In conclusion, the 444 telephone system is the perfect solution for any organisation that wants to improve its communication and efficiency. It provides a high level of service, flexibility, and future-proofing.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

In conclusion, the 444 telephone system is the perfect solution for any organisation that wants to improve its communication and efficiency. It provides a high level of service, flexibility, and future-proofing.

This system is designed to be future-proof, with the ability to adapt to new technologies and changing requirements.

With a 444 telephone system, you can:

- Get the latest information quickly and accurately.
- Improve your business efficiency, whether you have two locations or two hundred.
- Enhance your organisation's image as a modern and efficient operation.
- Be confident that your communications are secure and reliable.
STATIONERY FOR THE INDUSTRY

WITH the formation of BPC Business Forms Ltd in January, 1976, the 062 million British Printing Corporation confirmed its interest in the rapidly expanding data processing industry. To provide a sound, established base for this new company it brought together two separate and highly successful companies, each of which had its origins in the earliest days of the business industry, before data processing was conceived.

The two companies were acquired by Watertown Automation Services Ltd and Petty Business Forms Ltd, which were merged for internal reasons on July 1, 1968, and on January 3, 1970, began to trade under the new name BPC Business Forms Ltd, identifying the company with BPC directly.

The corporation's decision to expand its commitments in the manufacture and marketing of business forms business has been in specialist in this market to the exclusion of all others. Within the very small share of the total printing industry's revenue provided by business forms, concentration of effort has been total but comprehensive, so that the company can now manufacture every kind of business form.

Among its very wide range of products are data processing tapes, computer forms, typewriter forms, mechanical forms, and a range of forms feeding and handling equipment manufactured to assist users in the automation of paper handling operations without losing the advantages of different writing machines and their use in combination with different paper weights and multi-part forms.

Indeed, so many problems have been found in this field that the company considered the best solution was to install its own facilities to manufacture the material to give the necessary control. Now this part of the business produces more one tonne of carbon than many companies making nothing else.

Two extremely advanced film setting installations are in operation at each factory, and these, supported by the more traditional methods provide the degree of accuracy in composition so necessary when pricing to thousandths of an inch. This operation is conducted in clinically exact laboratory conditions, as may be expected when the consequences of inaccuracy can cause delay on computers, costing £1 per minute.

To the casual observer, perhaps the most impressive of many in the manufacturing operations conducted, is the production line for computer tapes and teleprinter rolls. Here, where the product tends to provide greater standardisation, the benefits of the advanced production equipment used by the company are visually apparent.

The basic operation is one of...
Computer Supplies

New tape from Boyden Data Papers

A NEW form of punched tape made from a double laminate of fire papers and sealed Nitro has been developed by Boyden Data Papers of Croydon for applications where a greater degree of durability is required than is normally present in conventional paper tape.

The tape was originally conceived specifically for the textile industry where punched cards currently used in warp and circular knitting machines; in this respect it is being evaluated by a number of manufacturers in the UK, Germany and Switzerland.

But, says Boyden, its durability and high temperature and humidity make it ideal for the following applications: as mechanical control, telegraphic operations, and automatic tape punching. Also, of course, it is suitable for computer usage, and this is expected to be a prime market area.

The Global Practice, right, sits and prints simultaneously computer tape to tolerances of 0.001 in an hour, and up to 400 cards an hour to 0.001 inch. In this way, the tape can be produced at the break of a sweat, and can be produced with the required accuracy of 0.001 inch in a few hours. In this way, the tape can be produced in a few hours, which is a great advantage in view of the fact that it is being produced at a rate of 400 cards an hour.

New tape from Boyden Data Papers

PICA Data Processing Accessories Ltd, help keep the oil industry ticking over smoothly. For instance, the latest handbook describing our highly refined data processing accessories, and showing how we can give you extra mileage for your money. Better ask about it and see us. We'll give you a quick fill up with all our latest information—you'll enjoy friendly spirit.

PICA Data Processing Accessories Ltd.

Townsend House, Crayford Place, London, SW1.

Tel: 01-834 7913

PICA Westminster Computer Room Facility at The Economist Centre

PICA's P4/US 29/02

Laser in use with 400 cards in a few hours.
WORKING ON THIN FILM MEMORIES AT HURSTLEY

WORK demonstrated last week at IBM's Hurstley laboratory on thin film memories revealed one aspect of a concentration of effort that ranges from product quality evaluation, and customer education to the world's control centre for PL-1 developments.

In addition to these known sectors, various unknown areas are the centre for development of potential techniques and products only identified by the "admittance" sign.

That work on thin film sensors has been going on at Hurstley for some time, and a new facility in the IBM Research Laboratory at York has been added to the IBM operation. This facility is dedicated to memory production. Discussions of the research taking place at York—18,000 bits of thin film memory in a 2-inch square plate—impressive and must be taken in to indicate the significance of this research phase has ended, and that the technique is mature enough for utility production, or one that must be abandoned in the coming years, perhaps in favour of 1,500, large scale integrated memory systems.

The memory plates are produced by a multiple vacuum evaporation process. Each cycle takes six hours and at some stage a bake out follows on an etching stage. The capacity of the single machine used is not adequate for production purposes but a bank of three or four such machines would enable production in the order of multi-megas per week to be obtained at a price lower than the present level of about $7 per bit. Switching time of the ferroelectric is of the order of one nanosecond.

Prototype production

An alternative indication of the future, however, was to be seen in work being carried out on the integration of 255 bit, 15M memory which are already in prototype production at Sun Jose in the USA.

Mr John Stannage, manager of the laboratory, outlined the work of the laboratory in addition to such technology developments as the thin film as being concerned with development of, back terminals, work on PL-1 computers, including new versions not likely to be announced for two years. Hurstley is also the current European centre for the RE.

FERRANTI'S ADE SYSTEM FOR DESIGN PROBLEMS

The ADE, Automatic Design Engineering, developed by Ferranti, is a powerful tool for the development of electronic circuits. It uses a set of basic layout drawings, produced by the ADE Reader, which is available in two versions—a standard version having a 31 x 33-inch drawing area, or a large board version with a 60 x 120-inch drawing area. Using a probe connected to this board, digital data can be extracted from a drawing placed on it, and combined with any other relevant data in the form of a tape listing a tape which is then used by computer input.

Any third generation compatible machine uses this tape to generate a set of numerical data which describes the particular part. This numerical data is then known as the part description file, and from it, the necessary control tapes may be directly produced on the same computer, using the ADE D-pack system, which links with APT and Ferranti Proform data systems, available for Ferranti Mk IV Controllers and Control Systems Multiface and SCOPE point-to-point systems, and for other manufacturers' numerical control systems.

Detailed drawings, which may still be required despite the highly automated production programs for inspection and reference purposes, can be produced from the same data using a further program in the ADE P-pack system. For this purpose, the computer would normally control the ADE Master Plotter, which is able to produce fully dimensioned, detailed drawings on paper tape, usually on sheets of less than one part per sheet.

In this way, the plotter may be used to produce standard rolls of microfilm, for applications outside industrial control computing, such as those required, for example, for blueprint, printed circuit masters, which can be obtained by the same computer with the ADE Master Plotter. On a total working space of 45 x 36 inches this device may be used to produce pen and ink drawings in a number of different options, or even to produce drawings.

We have studied the problems of converting 40 Column Card files to new media by conventional methods. We know it is difficult to avoid the following:

1. High Error Rates.
2. High Costs.
3. Long delays at Take-off.

We convert 40 Column Cards by Computer! Our 40 Column Card reader will read your files as they stand and create a file in one day. We provide you with your own Column Card reader, ready for your new machine. Unfortunately, this device cannot be incorporated during the run to produce your files for immediate use in your new system.

We can demonstrate the many successful applications that have been so far used, the prime requirement being that the machine has at least a 16K SRAM.

UGC moves into Europe

AS WAS expected, University Computing Co., of Dallas, Texas, moving into Europe with its Univite 1104 machines installed in the offices of UGC Ltd, in Paris, France, will join the European Community. The 80-row computer is expected to be sold in the UK as soon as the 1104 is introduced in the USA.

UGC Ltd., of Bloomsbury, New Jersey, in the USA, is a civil engineering contractor who already uses the 1104 in Birmingham from its UK office.

We're not prearming to the converted!

Presumably they have solved their file conversion problems — and paid the price!
The ops who keep track of 1,220 trains a day...

WHEN you were at school what did you want to be when you grew up? Not a computer operator, I'll bet. If you are male, chances are you wanted to drive a massive, clanking, steaming machine. No, not an IBM water-cooled mainframe, a steam engine.

Just as steam engines, lovely though they be, have given way to sophisticated vehicles such as the electric, high-speed train being developed for the Eurostar to Glasgow run, old semaphore signals have been replaced by more up-to-date methods of regulating trains.

The Great Northern suburban network links Kings Cross and Moorgate in London-to-Peterborough and Cambridge, and has 35 stations. When built, there were 57 signal boxes to control the 80 or so route miles, involving more than 260 actual track miles as a result of having four or more parallel tracks, sidings and so on.

When the network was electrified, all 57 manual signal boxes were replaced by one computer-assisted signal box at Kings Cross, which became fully operational in 1977. The area covered runs from Kings Cross and Moorgate to Sandy in Bedfordshire on the East Coast main line (the Edinburgh route), and Renown in Hertfordshire, on the Cambridge branch, including the Hertford loop line.

The signalbox is housed in a three-storey building (on the right as you leave Kings Cross, immediately before the first tunnel) which also contains a telecommunications center. In the control room, the movements of 1,220 trains are plotted each day, and during the evening rush hour 97 trains are monitored simultaneously on the 80-foot long horseshoe-shaped control panel.

Thirty-eight signalmen operate the signalbox on a three-shift system, setting points and signals on long stretches of track by pushing buttons on the diagrammatic plan of the railway. If the line is clear, the relevant points will be set to the required position, and when all safety precautions are met, the signals will change to green to allow the train to proceed.

On many stretches of the line, each train follows the same route as the preceding one, and to avoid the signalman having to set up an identical route for each train, the signals work automatically. As a train passes a signal, it changes to red, preventing the next train from following too closely.

As the next signal down the line is passed, the first signal changes to amber, allowing the following train to pass over caution. When the third signal is reached, the first signal changes to amber, and as the fourth signal is passed, the first one changes back to green.

Thus trains can run at 125 mph, under automatic control, separated by a total of four signals — well over the braking distance needed to stop an HST from its maximum speed.

In order that each train can be identified at a glance, they are depicted by coloured lights on the track plan. Points of strategic positions on the diagram, displays show the identity of each train — the type of train (fast, slow, or goods), the crew, and the train's number in the timetable.

These identities are fed into the system at London before they leave, and Hewlett-Packard minis track the trains along the system as they move. Train identities are passed to the next signal box down the line, at Peterborough, where a similar installation takes over the monitoring of traffic.

The identities of London-bound trains are passed to the Kings Cross box from the Peterborough box in a similar manner.

Consolidated Trading Results: 1.1.81 — 31.12.81

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th>1980</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turnover</td>
<td>£16,165,000</td>
<td>£14,410,000</td>
</tr>
<tr>
<td>Net Profits</td>
<td>£1,409,000</td>
<td>£919,000</td>
</tr>
<tr>
<td>Net Assets</td>
<td>£4,984,000</td>
<td>£3,385,000</td>
</tr>
</tbody>
</table>

Considerable growth in customer base in both the UK and Germany — large numbers of small systems orders signed for 4300 Processors — 9m order backlog as at 31/12/81 — further expansion of UK facilities planned for 1982 to include a new branch in Coventry — many orders taken in both UK and Germany during the 4th quarter for IBM's new 3081 Multiprocessor — first lease contract signed in France for IBM 4341 System and peripherals — rapid expansion of both staff and facilities planned in Germany for 1982 — substantial profits increase due to improvement in Group's residual position and falling interest rates.

Extract from the report of the Chief Executive and Managing Director.

Atlantic’s Annual Report and Accounts are available on application to the Company Secretary.

**ATLANTIC**

- IBM Systems Leasing
- IBM Computer Brokerage
- IBM Systems Engineering Services

ATLANTIC ANNOUNCES INCREASED TURNOVER AND A SUBSTANTIAL IMPROVEMENT IN PROFITS FOR 1981

**Nothing ventured...**

**ADVENTURE**

spoken one at a time in order to have any effect.

It appears that there is yet another Adventure derivative in the works (more are there for heaven's sake?), written in PL/I and incorporating a lot more features, rejuvating in the name of Bibbo.

I wonder where they got that idea from?

**Answers**

SIR, it's your friendly dungeon master again, with the answers to the Adventure and Dungeon problems.

Michael Stanley should give the golden eggs to the troll, then retrieve them by saying "FEF FFB FFB" (dead easy really).

Rob Carroll's problem is a lot harder. The egg is the only treasure hidden outside the cave, so naturally it cannot be taken inside the cave first. The thief must be allowed to steal it from you and take it back to his lair.

If you then manage to kill the thief, you will find that he has obtained the egg using his superior knowledge. This is not the end of Rob's problems, as he will then face the endgame with 100 more points to find.

I wish him luck — it's pretty devilish.

JEOF RICHARDS

Sutton, Surrey.