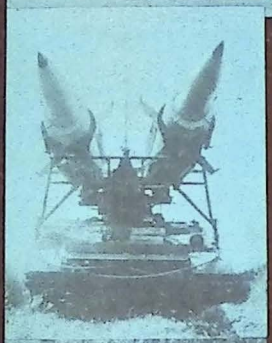
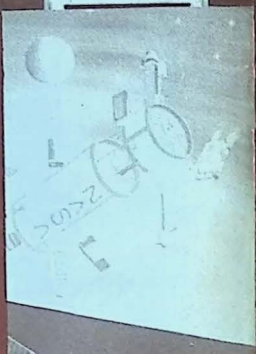
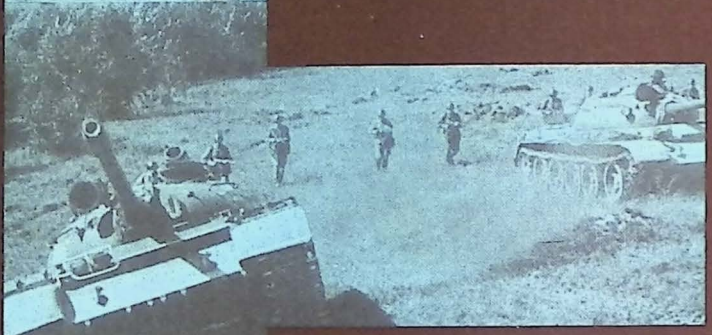
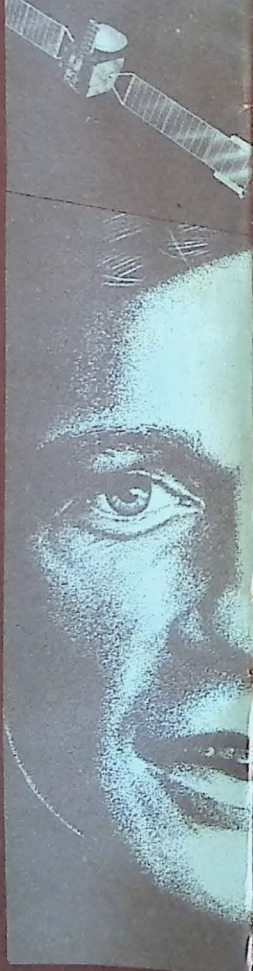
ETI 1999

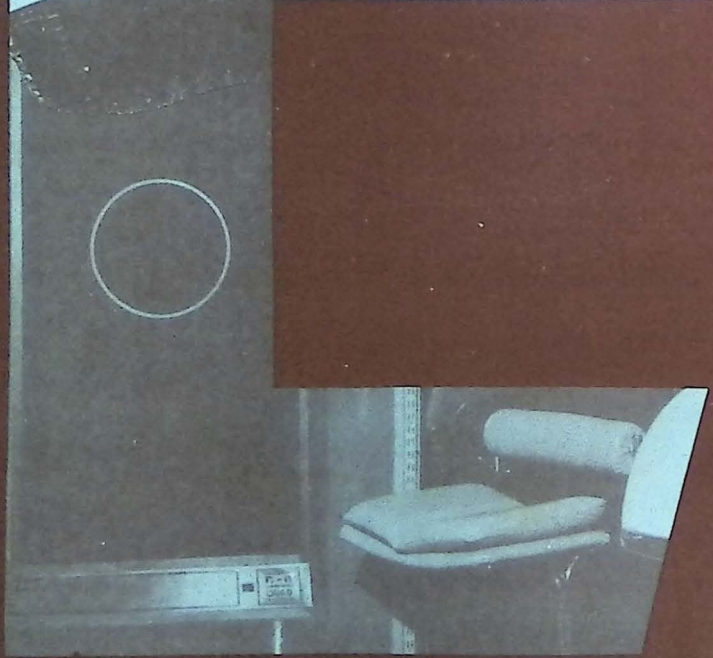
The Newton Crash
Psycho Symphonia
European Capital City
Skylab 10 Manufacturing
Electronics in World War III
Quad FS-13 Review
Skylab 10 Contest

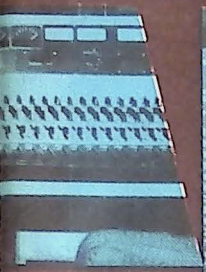


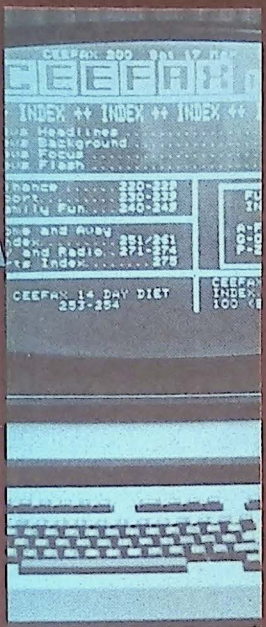


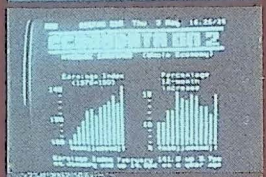


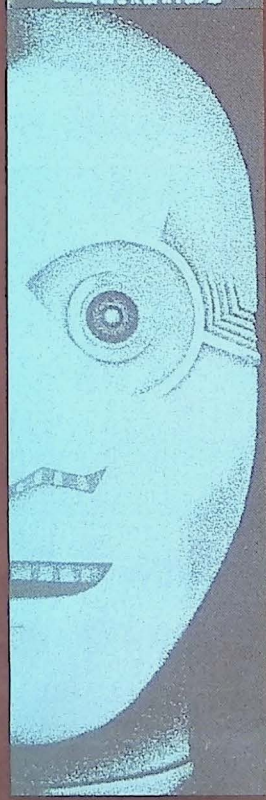












Contents

1999

NEWS

New Texas Typewriter

Following close on the heels of Binatone Ltd, Texas instruments have announced details of their new speech controlled typewriter/printer.

Unlike the Binatone offering, the Texas (TI 2258) will produce script from any one of 42 languages. Texas have told us that one of the main problems encountered during development was the generation of Cantonese graphics fast enough to overcome the speed of a speech input. This was ultimately beaten by utilising a new type of 'direct contact' laser writing.

The TI 2258 is totally compatible with Voxprint or any of the standard interfaces to the home terminal. Texas claim that the system will be completely universal by the end of next year, hopefully having the ability to translate into any of 254 languages. Price is expected to be around the E3200 area; for further information contact 0101-212-373-1358-96.

16M Memories In Cheese-Ola Packets!

The glut of 16M memory slugs has lead to the use of the device as a promotional insert in Plasfood's Cheese-Ola breakfast nodules. One 8-year-old in Wakefield is reported to have amassed 400 of these slugs and has used them to achieve immortality in the Watney's Book of Mosts by calculating the value of pi to 379,453,298 places!

'Stone Belt' Extended

Mullard are upset by the recent extension of the 'Stone Belt' area to Swindon, where the company was planning to build a satellite link station. Mullard now have to decide whether to stay with the current site, and pay an estimated extra E18M for the redesign of the station to meet the standards of the Countryside Act, or to choose a new site in an industrial area. As the company has in the past shown commitment to the Homework/Countryside movement, it is expected they will stay with Swindon.

These photographs show 'stone cone' local power stations designed by 'Mad Jack' Fuller. From left to right: Sugar Loaf Fusion, near Dallington, Sussex; Compton Pike Power, Compton Wynyates, Warwickshire; and Stone Cone One, Hebden Bridge, Yorkshire.

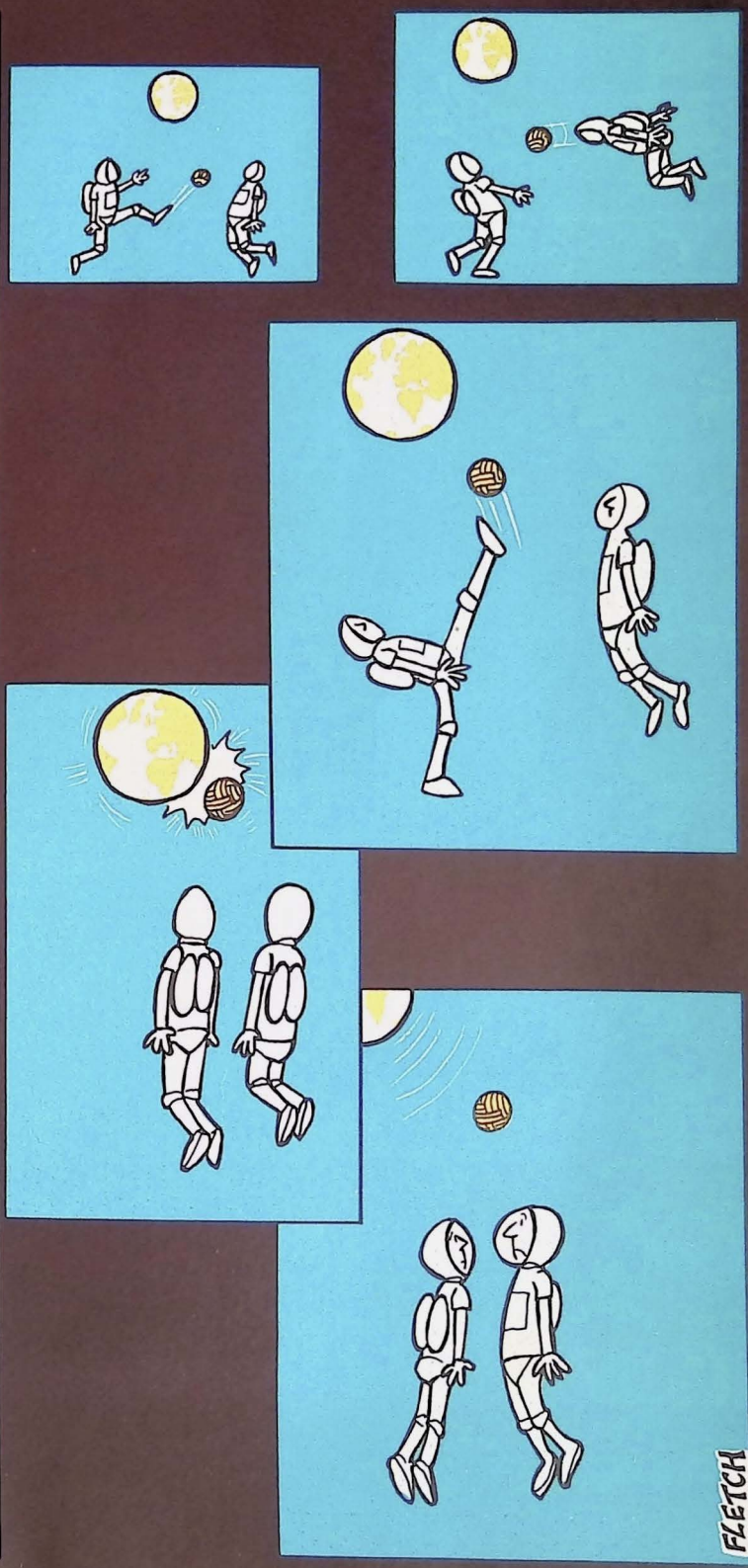
Is Orbitpower Responsible For Kew's Red Trees?

The change from green to red in the foliage of Kew Gardens has been baffling scientists for the last five years. Despite the threat to the huge tourist trade, the Royal Horticultural Society would like to positively identify the cause of the colour change. Equally baffling is the problem of explaining how the trees continue to flourish without photo-synthesis as we know it.

The leading hypothesis is that the leaves are operating in a radio-synthesis mode. They have been shown to absorb radio energy scattered from the nearby orbital-power receiving station.

If this hypothesis is true, do we then accept the even more outlandish suggestion that all leaves have the ability to change from photo-synthesisers to radio-synthesisers? The mind boggles at any attempt at explanation in terms of Darwinian evolution!

The 1999 designer prize from the Back To Stone Group goes to 'Mad Jack' Fuller, for his controversial 'stone cone' local power stations. Last year's winner, Bobby Brunt (who designed the thatched factory for Euromotors, in Wells), presented the award at a ceremony near Stone Henge II.

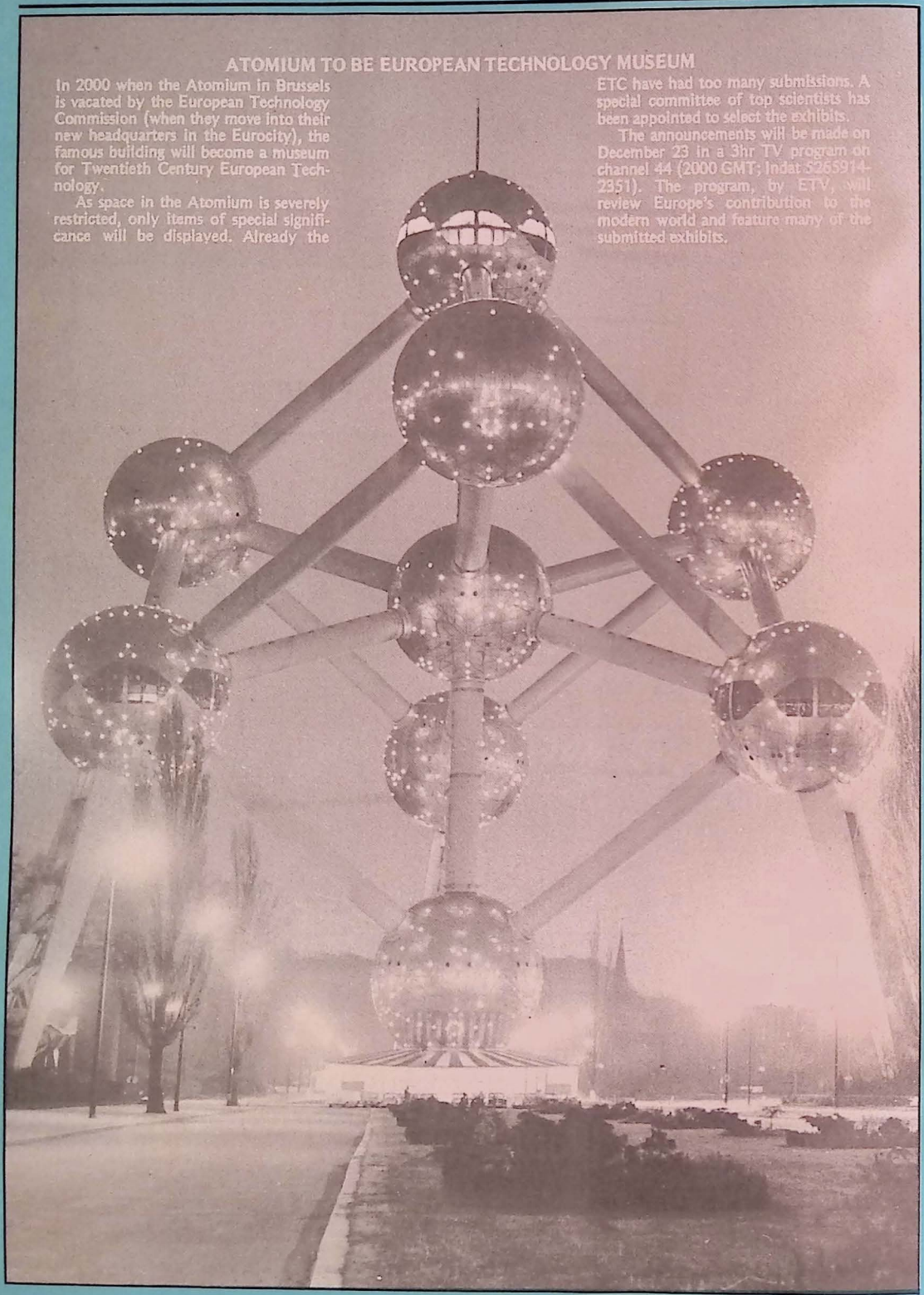


ATOMIUM TO BE EUROPEAN TECHNOLOGY MUSEUM

In 2000 when the Atomium in Brussels is vacated by the European Technology Commission (when they move into their new headquarters in the Eurocity), the famous building will become a museum for Twentieth Century European Technology.

As space in the Atomium is severely restricted, only items of special significance will be displayed. Already the ETC have had too many submissions. A special committee of top scientists has been appointed to select the exhibits.

The announcements will be made on December 23 in a 3hr TV program on channel 44 (2000 GMT; Indat 5265914-2951). The program, by ETV, will review Europe's contribution to the modern world and feature many of the submitted exhibits.



NEWS

EVACUATED-TUBE TRAIN IN AUSTRALIA

The world's first evacuated-tube transport system has been planned for the 600 ml link between Australia's two major cities, Sydney and Melbourne. The Federal government is currently arguing with the State governments of NSW and Victoria, who are putting up the capital, because no stop-off is planned for the capital city, Canberra.

The root of the problem is the extra cost of including Canberra on the line : another E600M on top of the E1000M bill.

The train will utilise magnetic levitation and be powered by a linear motor. The expected journey time is 25 minutes!

Much of the credit for recent advances in mag-lev and linear motors goes to BOC in Derby for their developments in cryogenics and superconductivity using metalic hydrogen. The Australian system is designed to store electricity in deeply-buried inductor-convertor units, which also rely on superconductivity.

DISCOVER MUSIC VIA TERMINAL

The European Telecommunication Electronic Corporation (EuroTEC) has just launched a new product in their extensive range of data systems. Computer Aided Disc Selection (CADS) has been developed over three years and is the first fully operation system in this field.

The commercial terminal has a 2M of memory for disc storage. This can be increased by simply transferring the stored information to the Computer Control Library, where all the signal and data processing is carried out for transmission.

The Control functions include an alphanumeric keyboard for data input (record title or code number), which is simultaneously viewed on a fibre-optic display. The display can show any of the information held in memory (including your account statement).

Two sample buttons are provided: sample 1 plays vocal/instrumental, sample 2 plays the instrumental track only. Listening to samples is free of charge.

There are four modes: Accept, Cancel, Play and Pause. The display can be set to Recall, Run, Hold, or show your Account. And the memory control provides Shift or Recall.

The unit is interfaced with your audio system via a data line connector.

EMRASER RECEIVER BOOM OVER?

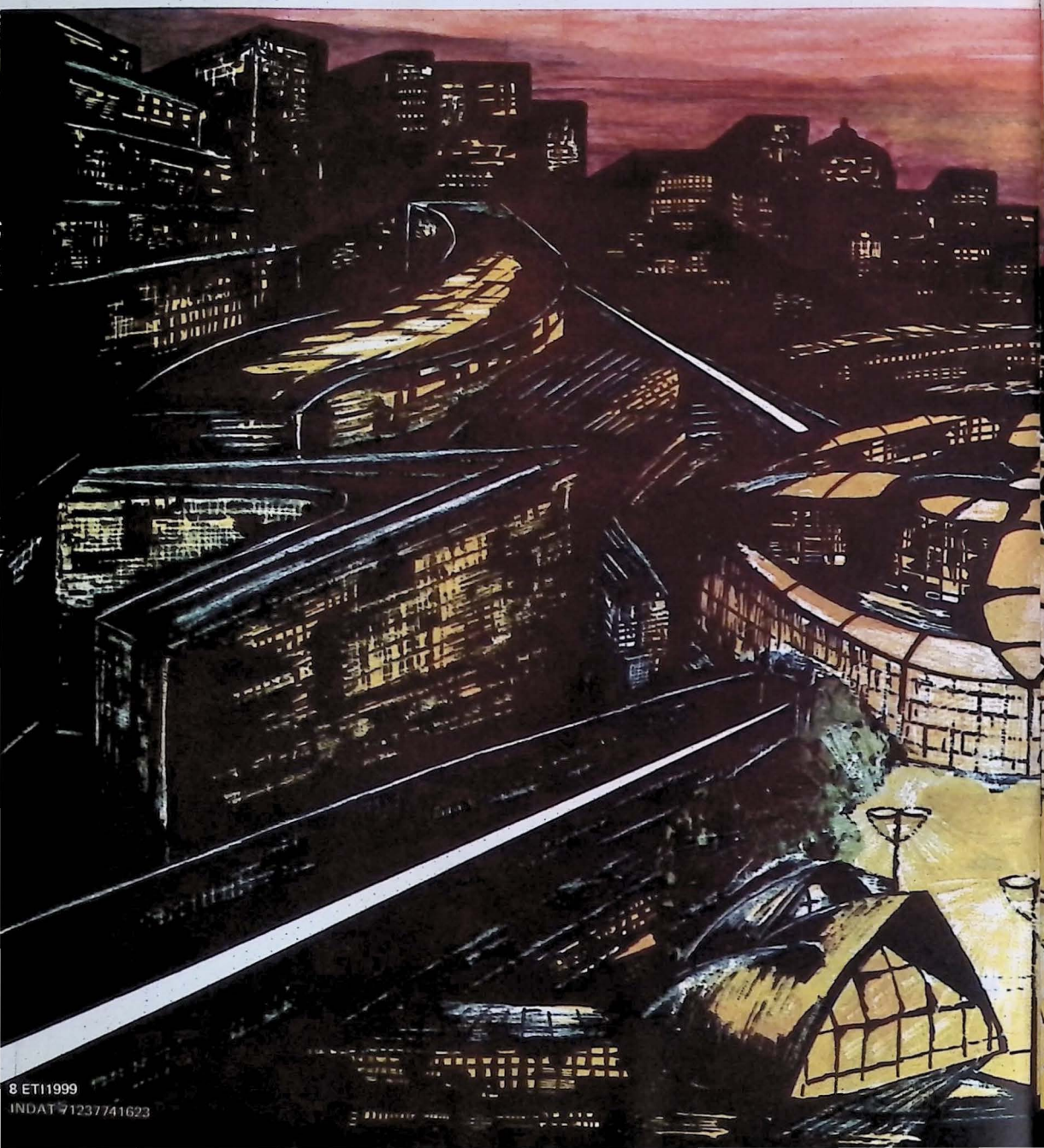
It is now two years since the start of commercial production of emraser receivers. Growth of the market has been dramatic but signs of saturation in the electro-magnetic spectrum herald corresponding economic saturation. The development of programmable deflector units made the emraser receiver suitable for satellite use with mobile stations (see p42 in this issue), which has kept production at a high level in the last year. But the latest Cutema report (Indat 27143792415) predicts a drop from 1999's E1250M business (worldwide) to one of E680M by 2004.

"UNDERGROUND CITY" OPENS PARK

The "Underground City" in the Mojave desert in California opened an above-ground park this month. UC was an experiment in underground housing back in the late 80s – before the fad for this kind of living in the early part of this decade. When energy crisis was declared finished, the State's Parks Commission granted $8M to make UC a nice place to live. Another $8M was put into the project by the UN – because UC is once-again guinea-pig-town, this time the test bed for 'oasis-ization'. The photo shows the park in its phase of arable testing for the UN. When the tests are over the fields will become lawns, playing fields, etc.

THE WIRED CITY

Halvor Moorshead looks at the world's most advanced communications system



8 ETI1999
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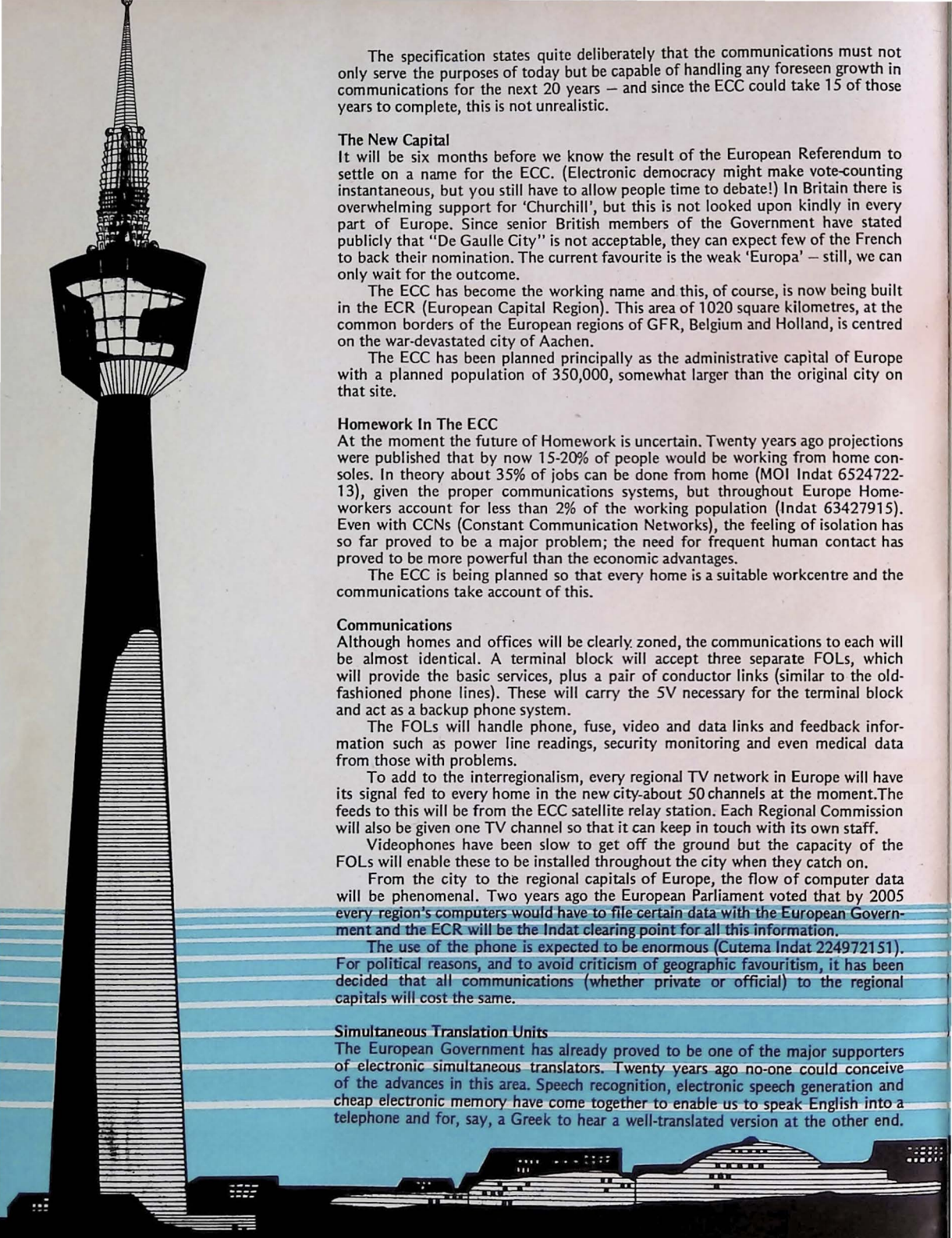
With the principal plans for the ECC (European Capital City) already approved, tenders are currently being sought from all the large European electronics companies for the city-wide communications network. The network will be centred on the Eurotower and will extend throughout ECR.

"The largest single electronics contract ever" is how some pundits have described the communications system for the ECC. This is probably an exaggeration: the space program of the 1960s and the FOLs (Fibre Optic Links) already installed in the new city were giant orders. Nevertheless, a brand new communications system for a city of over 350,000 with all the latest technology is a prize worth in the order of a Billion Eurodollars.

The technical specification is impressive. Every home and office has to have access to five times the communications inputs and outputs than we now consider normal in the cities of Europe North. Most of this is due to the multilingual operation of all services but also due to the growth in Homework, which means every home has at least the potential to become a computer centre.



The specification states quite deliberately that the communications must not only serve the purposes of today but be capable of handling any foreseen growth in communications for the next 20 years – and since the ECC could take 15 of those years to complete, this is not unrealistic.

The New Capital

It will be six months before we know the result of the European Referendum to settle on a name for the ECC. (Electronic democracy might make vote-counting instantaneous, but you still have to allow people time to debate!) In Britain there is overwhelming support for 'Churchill', but this is not looked upon kindly in every part of Europe. Since senior British members of the Government have stated publicly that "De Gaulle City" is not acceptable, they can expect few of the French to back their nomination. The current favourite is the weak 'Europa' – still, we can only wait for the outcome.

The ECC has become the working name and this, of course, is now being built in the ECR (European Capital Region). This area of 1020 square kilometres, at the common borders of the European regions of GFR, Belgium and Holland, is centred on the war-devastated city of Aachen.

The ECC has been planned principally as the administrative capital of Europe with a planned population of 350,000, somewhat larger than the original city on that site.

Homework In The ECC

At the moment the future of Homework is uncertain. Twenty years ago projections were published that by now 15-20% of people would be working from home consoles. In theory about 35% of jobs can be done from home (MOI Indat 6524722-13), given the proper communications systems, but throughout Europe Home-workers account for less than 2% of the working population (Indat 63427915). Even with CCNs (Constant Communication Networks), the feeling of isolation has so far proved to be a major problem; the need for frequent human contact has proved to be more powerful than the economic advantages.

The ECC is being planned so that every home is a suitable workcentre and the communications take account of this.

Communications

Although homes and offices will be clearly zoned, the communications to each will be almost identical. A terminal block will accept three separate FOLs, which will provide the basic services, plus a pair of conductor links (similar to the old-fashioned phone lines). These will carry the 5V necessary for the terminal block and act as a backup phone system.

The FOLs will handle phone, fuse, video and data links and feedback information such as power line readings, security monitoring and even medical data from those with problems.

To add to the interregionalism, every regional TV network in Europe will have its signal fed to every home in the new city-about 50 channels at the moment.The feeds to this will be from the ECC satellite relay station. Each Regional Commission will also be given one TV channel so that it can keep in touch with its own staff.

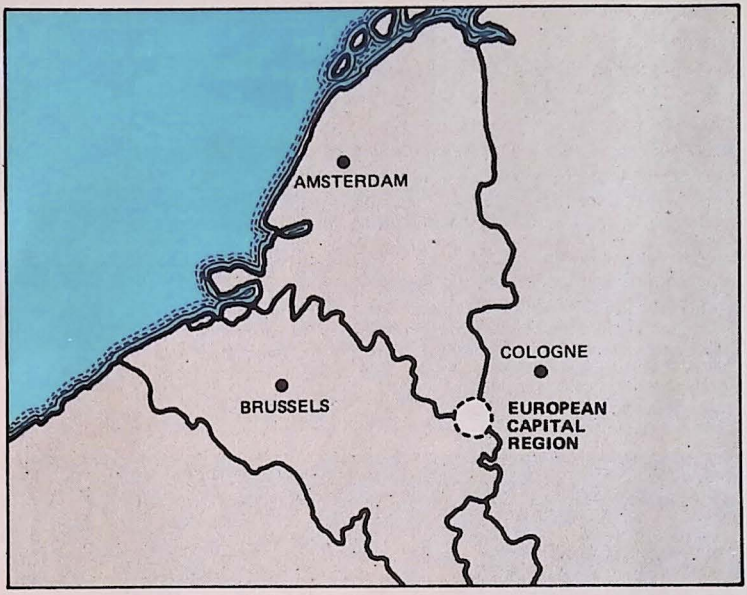
Videophones have been slow to get off the ground but the capacity of the FOLs will enable these to be installed throughout the city when they catch on.

From the city to the regional capitals of Europe, the flow of computer data will be phenomenal. Two years ago the European Parliament voted that by 2005 every region's computers would have to file certain data with the European Government and the ECR will be the Indat clearing point for all this information.

The use of the phone is expected to be enormous (Cutema Indat 224972151). For political reasons, and to avoid criticism of geographic favouritism, it has been decided that all communications (whether private or official) to the regional capitals will cost the same.

Simultaneous Translation Units

The European Government has already proved to be one of the major supporters of electronic simultaneous translators. Twenty years ago no-one could conceive of the advances in this area. Speech recognition, electronic speech generation and cheap electronic memory have come together to enable us to speak English into a telephone and for, say, a Greek to hear a well-translated version at the other end.



MOI reports (Indat 229471712-3-4) describe two problems which have now been largely overcome. The major problem initially was the use of 'non-stored words' by the users but it quickly became 'bad-form' to use words not included in the '15,000 Preferred List'. Modern translators allow a lot of colloquial expressions but these are avoided by the experienced users.

The specification for the telephone system calls for advanced 50,000 word translators at all phone exchanges so that either the sender, or the caller, can select the output.

The second major problem has been the translation rules – the subleties of language don't matter much for casual or even commercial use but a large portion of the work at the ECC will be semi-legal where non-ambiguous translation is necessary. This has led to a Standing Translation Committee being established to decide on the problem words.

Portable translators became available two years ago and there are rumours that we shall soon be seeing a 12-language automatic portable translator.

Radio Systems

The RF spectrum in the ECR is going to be shaken up well and truly but in quite a different way from that in other European cities.

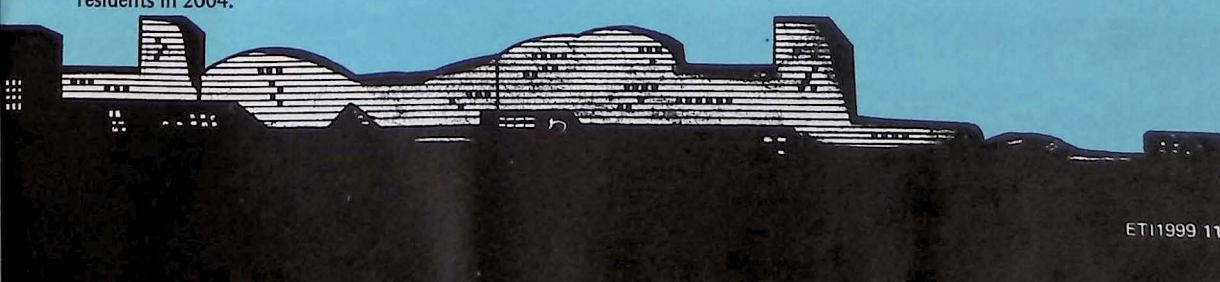
From the communications pod of Eurotower there will be satellite links both to destinations inside and outside Europe but there will be no TV broadcasting (this is still by far the largest user of the best frequencies in most of the world).

Roads

The planners are expecting 200,000 road vehicles and 60% of these are likely to be fitted with IAC (In-Auto-Communications). As readers will be only too well aware, the failure to agree on an international standard has led to enormous complications. The Siemens system is that likely to be adopted in the ECR. IAC will provide simple paging, phone links and entertainment – all in Band XVIII (2.3 GHz).

The Challenge

The new capital of Europe is going to be a major challenge to the designers. The tenders have to be submitted within a year and the successful contractor is likely to start work about 12 months after that, well in time for the first permanent residents in 2004.



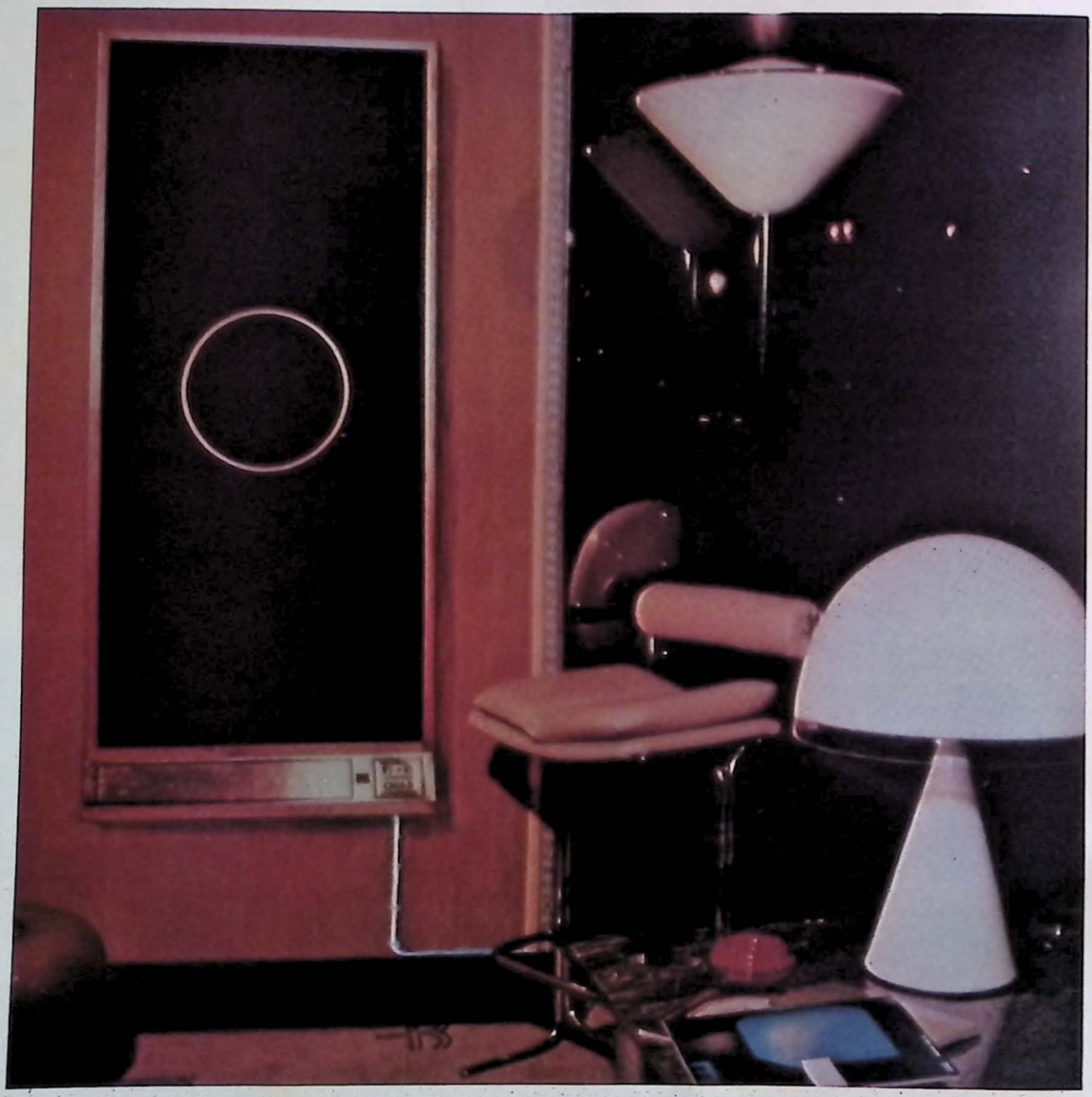
QUAD FS-13

Ron Harris reviews a revolutionary new design

The FS-13 is only the third loudspeaker ever to carry the Quad name. With forty years of manufacturing history behind them now, this record speaks well of their products and enviable market performance. This stability is particularly unusual in hi-fi manufacturing where models seem to change with the tides.

The first Quad electrostatic was produced back in the late fifties and lasted virtually unchanged into the early eighties, when it was replaced by the ELS-2, largely to improve bass performance and power handling. Both these designs met with unqualified success, although the ELS-1 was probably ten years ahead of its time and suffered accordingly until the rest of the field caught up.

It is thus a major event for a new design to appear from Quad — and after only eight years too! As you can see from the photographs this unit represents a complete departure from presently accepted electrostatic loudspeaker theory.



For example it is designed to be hung on a wall – flat against it. For a dipole radiator this would be out and out lunacy. *All* electrostatic units are dipole radiators. What, therefore, are Quad up to? Has someone down there cracked up? Is all lost with Europe North's leading loudspeaker company? Read on:

Forced Design

When their factory was destroyed in the war – apparently by an American plane – Quad were forced to rethink many of the company research criteria. At the time they had a prototype FS-13 in operation, but this was a refinement of the ELS-2, as opposed to the final conception which is anything but that.

The missile took out all the prototypes, research records and simulation software that the firm had in existance. Mercifully it occurred on a Monday – a non-work day in that area – and no staff were present. After that they made the decision to start again from zero and the result was a major breakthrough in diaphragm control.

Quad are naturally a bit reticent to explain too precisely how their new baby obtains its total versaility, but in these days of program-orientated integration a chip can be served up to do virtually anything it seems. The crossover design here includes four PLAs (Programmable Logic Arrays) two transmission gates (VFET-plane doped) and an 'analog sampling' device set to operate at a 1 MHz clock rate.

All this high-power hardware feeds an 'etched cone' set-up similar to that employed by Wharfedale and Celef in their respective Isodynamic Monitors. The difference here lies in Quad's methods of vacuum-forming the plates, prior to etching, such that track density is maintained throughout, thereby insuring even distribution of the motivating field across the driver face.

The HF driver has been formed into a dome, which, although imparting a slightly odd appearance to the finished enclosure, does ensure good dispersion and accurate imaging even when wall mounted. Controls are provided to vary roll-off into this unit and to tailor bass plate behaviour to suit the chosen room location. Stands are also provided for those who prefer free-standing units, although the sheer size of the FS-13 argues against such a decision.

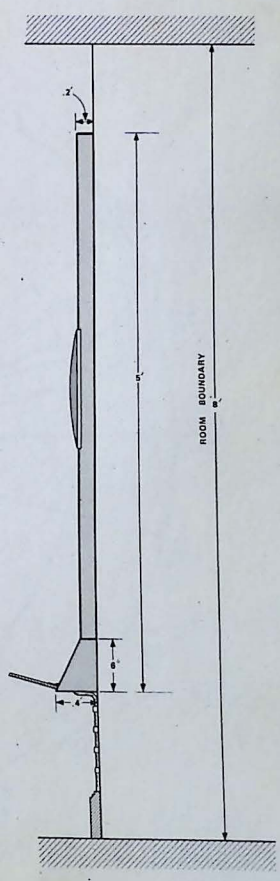
Control Decisions

The FS-13 is a true electrostatic speaker. The driver is sandwiched between two high voltage polarised planes, which act upon the drive signal to deflect the polymer-based sheet accordingly. However, in order to allow for wall use, with all its attendant advantages, the normal dipole radiation pattern (equal anti-phase air excitation from front and rear) had to be controlled.

You obviously cannot allow 100W of power to be reflected from a room boundary a matter of inches from the drive plate. Quad's answer is really very straightforward. The polarising voltage supplied to the rear plane is made position (and signal) dependent!

For wall mounted operation, the mean position of the driver between the planes is shifted by increasing the voltage applied to the plane nearer the wall. The distance is thus increased between driver and wall. This extra distance is then used to 'brake' the driver as it moves backward by varying the polarising voltage according to the amount of relevant phase information in the signal at that instant.

This means that if the signal calls for a large excursion to reproduce a 30Hz organ note, say, the plate would be allowed to move outwards perfectly normally, but on the return half-cycle when it should be moving toward the wall, the FS-13 crossover produces a 'cancel' signal which brakes the movement AT THAT FREQUENCY to limit the energy produced to 10% of what it would otherwise have been.



Smart Diaphragm

Now before you ask me how this is actually achieved I have to confess I don't have a clue! The software controller for this fits into 72K of ROM and that seems nothing at all when you consider what that controller has to do. Somehow it must sum the signal presented to it in terms of required energy and phase information. It must then apply a corresponding polarising signal between 2kV and 8kV to the planes such that the original signal is not distorted upon replay – *but* does not produce significant rearward movement of the driver either.

Naturally Quad won't say how it's done and short of spy tactics there is no way ETI is gonna find out. Naturally the PLAs and ROM are of the 'secure' type developed during the war, and will self randomise if any attempt is made to read them.

God – companies are suspicious these days!

Still I suppose there is good reason here, what Quad have in effect is a speaker with a 'smart' driver that knows what is required, and desists from that which is not, by a rapid (1MHz) self correction process. (This will probably revolutionise loudspeaker design).

Testing Time

I ran the FS-13 through a pretty rigorous set of tests to see how well all this signal processing was being done – and how much the input was being degraded by the time it became the output. As you can see from the results I need not have bothered. Quad's comment was – with raised eyebrows – to ask if Rolls Royce ever sold a car with faulty transmission. Cocky lot . . . . . .

Distortion figures more than bear comparison with the best 'ordinary' (a term other manufacturers are gonna have to get used to) speakers being typically 0.02% at any power, all frequencies. Dispersion is excellent, that dome more than earns its position by smoothing out off-axis response to 65°.

One little foible did appear, however. The bass response is significantly improved with the radiation control set for wall mounting. The speaker will produce nearly a full octave lower with the controls set thus – EVEN WHEN USED FREE STANDING. This is simply because limiting the rear energy as perfectly as this means that cancellation effects are reduced dramatically.

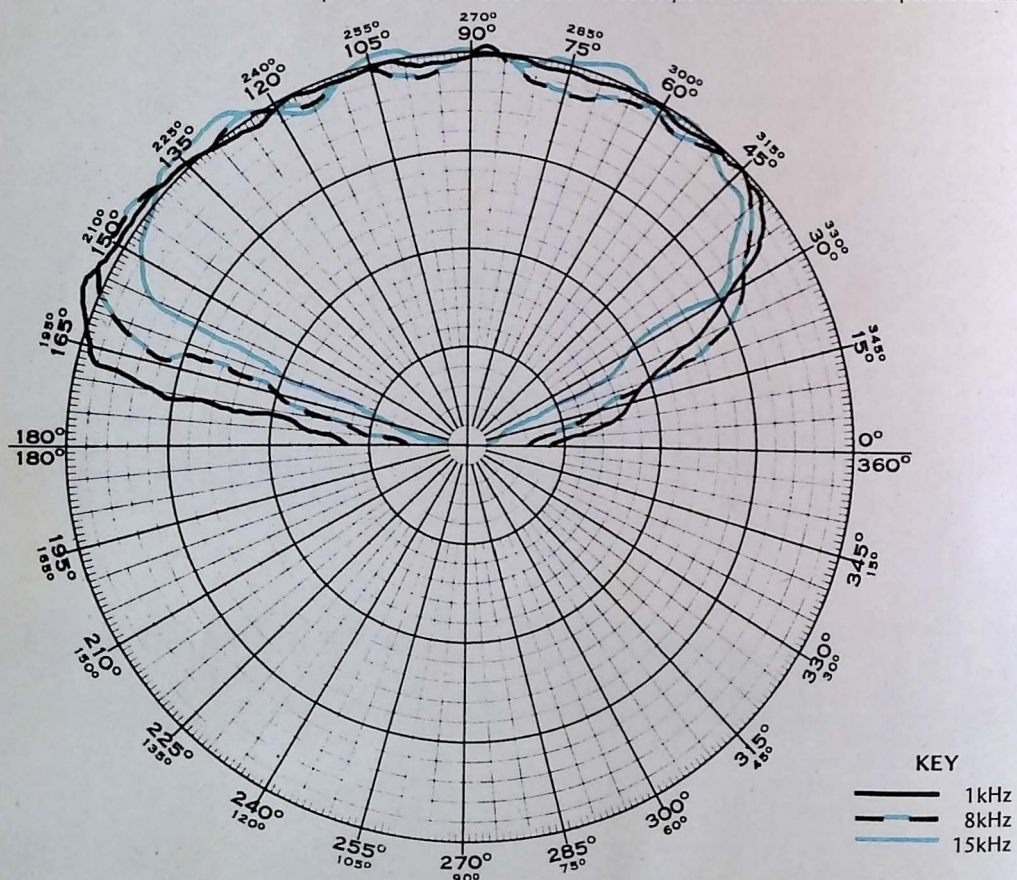
This seemingly small contradiction leads onto the fact that this system, would, therefore significantly improve any type of loudspeaker . . . . . Any type from any manufacturer.

Food for thought, eh Quad?

Below: Polar response of the Quad FS-13. Zero degrees refers to speaker radiating face. When the speaker is used free standing the rear radiation pattern is identical. 'Wall mounted' mode reduces this radiation to an insignificant amount, rendering measurement both inaccurate and meaningless. Note the exceptionally wide dispersion at high frequency.

Sound Thinking

In use the FS-13 is intended to be positioned at such a height that the dome is approx. at ear level. Since the dispersion is good at HF, this can only be to prevent bass coupling with the floor and ceiling, this preserving the specified working conditions. Too close to the floor would introduce a 'hump' into the frequency response due to reflection and the consequent reinforcement at a specific but ill



defined frequency.

Brackets are provided to facilitate wall mounting, and a form is included with each pair of speakers which will obtain you a free set of stands for more conventional use if returned to the makers. In other words you are advised to wall mount the FS-13, but if you insist upon being perverse Quad will accommodate you.

In order to set up the review pair correctly I had to remove my flat television and two bookcases. Be warned – these units are pretty big. Ten square feet big. (Oh alright 0.93m^2 if you must). Not much room left for much else once they're a'hangin' on de wall!

The controls are nicely concealed behind the smart flap when not in use, with just the power light left showing to remind you they're on. Actually it does not matter a lot since there is no power switch anyway. The FS-13 turns itself on once a signal appears on the audio line and off again once 10 mins. as elapsed with none.

The switch-on can be triggered by a click such as made by most disc scanning systems reaching sync, or by the ident code present on all PCM tapes.

Music To Go Deaf By

In use the FS-13 thoroughly out-performed any other speaker system I'd heard. After this it's curtains for my Dayton Wright Mk5s – which are twice the size, bulky and fussy to use. These Quads make them sound silly anyway. Power handling is incredible, they absorbed the full 400W from my Lecson AP7 without distress. My ears and neighbours broke first. The only problem with these speakers is likely to be the room you use them in – it should be big (at least 9m x 6m) for best bass response.

However, regardless of room restrictions, I can guarantee that the pure uncoloured sound and meticulous detail of the reproduction from the Quad FS-13 will alter your views on hi-fi.

All that remains now is to sit back and watch the other manufacturers scratch each other's eyes out trying to catch up. I shall drown the screams with Ravel a la FS-13.

TEST RESULTS– QUAD FS–13

Serial No. 0085

Frequency response	(free standing)	: 60Hz – 22kHz ±2dB
	(1m from boundary)	(–12dB at 30Hz)
	(Wall mounted – Min. area 25m^2)	: 42Hz – 22kHz ±3dB (–6dB at 25Hz) (see graph)
Frequency/phase linearity		: 0.01° per kHz (linear ± 2° across audio band)
Power handling		: 500W for 1 second operates trip. : (or 1000W 0.4s)
Horizontal Dispersion		: –3dB at 20kHz at ±65° driver axis. (see graph)
Distortion maxima (100W)		: 30Hz (0.02%) 108Hz (0.03%) 1.31kHz (0.005%) 21kHz (0.01%) (see graph)

Results produced on Commodore/B–K ATE. System controller : PET 4002 (Level 4).

More Than Humanly Possible

Kate Smith doesn't want robots to decide the future of humanity

"Wreck a Robot Today!"

The quaintly archaic term may bring a smile to your lips but it is being used in earnest today. It is an emotional way of drawing our attention to dangers that a small group of people in this country feel are threatening the very quality of our lives, irrevocably and for the worse.

The "robot" of science-fiction and the Automated Assistant of the real world have, as we know, very little in common. Neither monstrous nor sinister, the AA functions efficiently and swiftly in response to the needs of government, commerce and industry. Why then the concern? Let us look more closely at the role of the AA in the areas where it forms part of the routine business of life.

The APOD (Automated Pay-Out Device) is a commonplace feature of banks, shops, cinemas, theatres etc. Everywhere, in fact, that personal financial transactions takes place. Money, or rather the need for having it on your person, is well and truly a thing of the past. When was the last time you were "short-changed"?

Those who opposed the APOD back in the eighties maintained that the absence of the human face behind the "counter" was symptomatic of the increasing depersonalization of life. This reaction was, of course, anticipated and hence the very gradual nature of the introduction of the APOD. Indat figures from the MOI's data banks reveal how public hostility, at first quite substantial, was overcome by the Freedom of Information Act of April 1991, revised and expanded last year.

Beyond The Point Of No Return?

To turn to another area. Have you ever considered what transport in the capital would be like without the AA? Your friendly UV (Underground Vehicle) driver and the pilot of your OAT (Overground Automated Transporter) speed you to localities which would be totally inaccessible without their assistance. How can we ignore the value of this kind of automation? Remember the crisis of 1995. It is no exaggeration to say that, in this area certainly, we are now dependent on the efficiency of the machine, for better or worse and that the structure of our transport being what it is, it would be a grave problem should automation fail us. The point is though that this likelihood is remote. Should we waste our energies anticipating it?

Industry relies almost totally on the AA and has done for many years. Which one of us, I wonder, would be prepared to work in toxic environments or at the bottom of the sea? Through the use of the AA the risk to human life has been minimised and the way been paved for the kind of exploration and advancement never before possible.

When Slave Becomes Master

So far so good. There seems no reason to challenge the value of the AA in any of the areas mentioned. Let us now turn to a field more open to controversy which will lead us to what seems to be the root of the concern.

For many years artificial limbs have been an accepted and acceptable aid to medicine. Thousands of men, women and children owe their lives to what I shall call advances in "robotics". However, tentative steps are now being made towards the development of artificial organs. Work done by the team at Cambridge (Indat no. 795570028) is leading the way to the reproduction of the liver, the kidney and the pancreas. How long will it be before the brain, with all its intricate, subtle and mysterious abilities, is reconstructed? Now this sounds ludicrously fanciful I agree but look at your response to the notion more closely. I myself and, I am prepared to guarantee, you the reader, feel an instinctive revulsion at the prospect. The reasons for this revulsion constitute the reasons for the present concern.

How Far To Go?

It is not the functional role of the AA as a servant of man, responsive to his material needs, that is causing the unease. After all, the presence and efficiency of automata in our society contributes so much to what perhaps we take for granted, our freedom to devote our energies to developing our own interests and talents. Up till now, the AA has never been regarded as a challenge to the particular qualities which we value as part of our basic humanity. Their "intelligence" is man-given, their emotional capacities non-existent. They know neither compassion nor hatred. These are human privileges. But if the AA is to increase its usefulness to man, and this is surely its only function, then it must become more sophisticated and sensitive. The question is, how far are we prepared to allow this process to develop?

It is the contention of those who fear the development of the AA that an equation has come into existence that should make us pause. They fear that automation has become synonymous with advancement and that it is high time we questioned the exact nature of this advancement. I must add here that those who are concerned are not merely sentimental fringe groups but eminent scientists and automologists who have recorded their worries quite openly (Indat no. 500173124).

Where The Line Should Be Drawn

"The moment will come when, like it or not, man will have to choose. His intelligence can lead him into bondage or the Brave New World. Either alternative is possible". Thus Professor Newton-James in his seminal work on automata, "In His Own Image" (Indat no. 096472158) foresaw a dilemma which I think will become more and more urgent in the years to come. It is not, I think, too fanciful to imagine a time in the not too distant future when the AA will be employed in decision-making roles. Already in the world of sport they act as linesmen and referees for they are totally disinterested and unfailingly accurate. To permit the AA to participate in decision-making on which depends the welfare of humanity must, however, be and remain unthinkable. The essential point to remember is that the AA has an important and useful part to play in the smooth running of human affairs but it must never be allowed to dictate them. Its abilities, unlike those of its creators, must be limited.

WORLD

March 11th-March 27th 1989
An appraisal of the influence of electronics upon the resolution of the conflict.
Exclusive ETI report

Our aim in this article is to illustrate, by means of detailed incident reports, the scope and importance of electronics during World War Three. Over ten years has passed since that conflict and it is the release of previously classified material this month that has prompted this article.

We cannot attempt, within this article, to cover comprehensively all the different types of EW (Electronic Warfare) such as ECM (Electronic Counter Measures) ELINT (Electronic Intelligence) and the rest. Rather we shall discuss some of the more important techniques and machines as they were applied in the war and thus hope to convey to the reader the atmosphere of the electronic 'dimension' of the most important conflict in history.

Early Indications Are Ignored

A full decade before the Soviet invasion of Germany in 1989, the United States had conducted naval exercises in which small EW detachments had convincingly beaten much larger forces merely by confusing and counfounding as opposed to attacking. Despite such early proofs and a continuingly improving capability in the West to exploit such techniques, the early days of WW3 saw the Soviets drive home the lesson the hard way – using markedly inferior equipment.

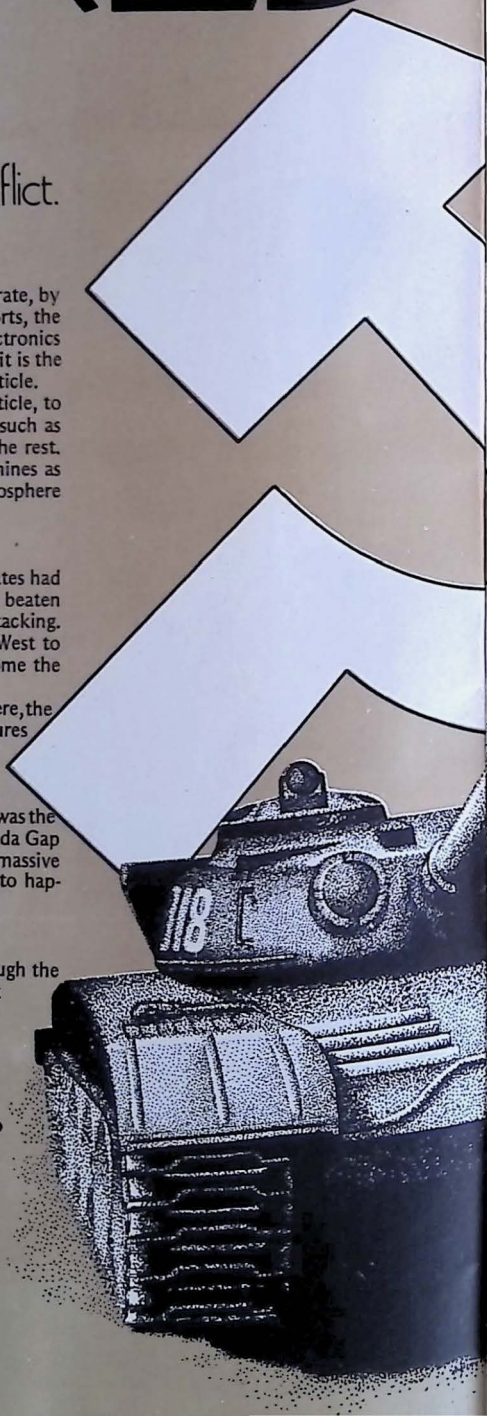
Basic though their techniques were, the Soviets were able to effectively disrupt NATO front-line command structures for between two and four days until initially under strength EW forces were brought up to full effectiveness and a more unified command structure began to negate the initial Soviet advantage to some extent.

The most striking usage of this was the isolation and partial negation of the armoured divisions stationed in the Fulda Gap – the very area which had always been earmarked as the most likely for a massive strike by the forces of the Warsaw Pact. Indeed this is precisely what was to happen, but not immediately as we shall show.

The First Blows Are Exchanged

On the morning of March 11th 1989 four Soviet armies smashed holes through the thin NATO line all along the front – but not at Fulda. Instead the tank forces stationed there were subjected to complete blanketing of their communications for 20 hrs. Commandos were dropped in behind them, disrupting land-lines and supply routes, totally confusing reports transmitted by that means. Ground to air missile sites were also destroyed removing air cover from the tanks – a vital defensive factor.

Jammers blocked all usable radio channels and so many conflicting reports were flooded in on supposedly secure links that the division commander was effectively paralysed. In addition the force was continuously pounded from the air by a variety of aircraft, including the MIG 34 'tank buster' (a virtual copy of the American A10), which was used air-to-ground missiles capable of distinguishing the more important targets by infra-red means. (A Leopard tank has a much greater heat "signature" than a truck, for example.)



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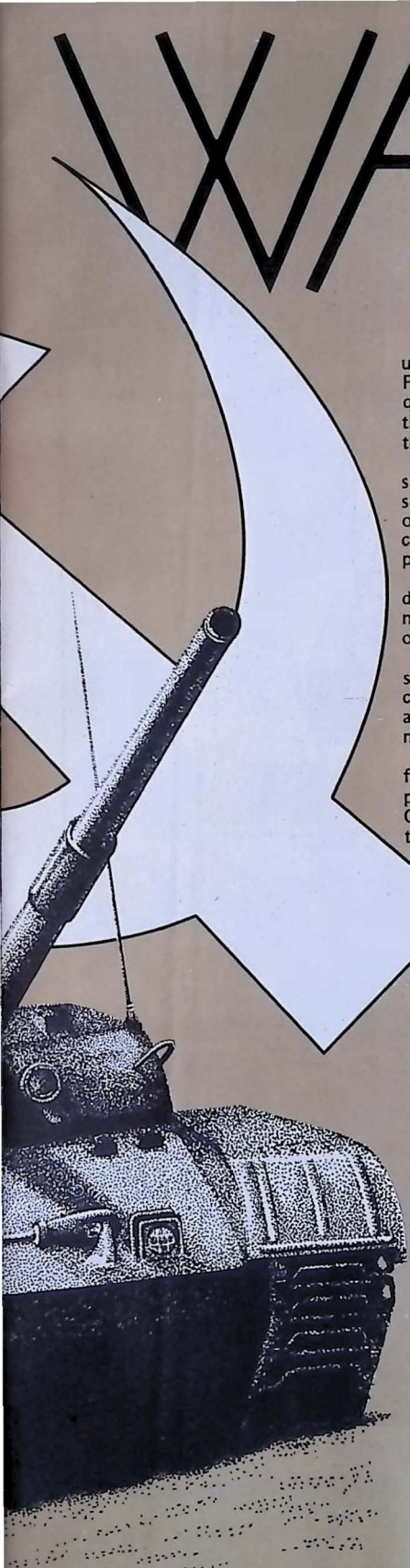
WAR III



The division's anti-aircraft vehicles, which used radar to 'lock' onto a target, were at first rendered ineffective by high flying Foxbat fighters which broadcast beams of high power radar energy at a swept frequency, causing the guns to track *them* instead of the swooping SU34s. In the end the gunners turned the radar trackers off and resorted to somewhat older methods to drive off the Russian aircraft – visual target acquisition.

The Division Commander took the decision to move his force away from the Gap early next morning in order to gain some relief from the ceaseless air attacks. He had received virtually no cover for over 12 hrs since a flight of F15C Eagles had decimated the Russian SU34s in a convincing demonstration of superior ECM (Electronic Counter Measures) and firepower. Two Eagles were shot down, one by NATO missiles.

As soon as the three German armoured divisions were moving, the Soviets struck. The massive Third Shock Army with nearly a 1,000 T-72 and T-82 tanks, over 500 field guns and mortars and upwards of a thousand other vehicles attacked through the Gap itself with heavy air cover.

The surprise was total. With most of the surveillance satellites having been taken out on the first morning and the division's communications effectively severed, NATO had no real way of knowing that such a force had been massed there. Aircraft photos had shown nothing except 'normal' military activity of a local and ill-defined nature.

The only factor which saved the Germans from total annihilation – and NATO's centre area from being overrun – was the positioning of 40 of the new SENtenEL tank killers along the fringes of the Fulda Gap area. These were automatic radar-assisted 'tank killers' which took out 30 of the front-line tanks in seconds as the Soviets passed through their fields of fire.

Due to the SENtenEL's 'programmability' and silhouette recognition capability, 12 APCs (Armoured Personnel Carriers) were also crippled before the attacking force realised they had not eradicated the enemy 'troops' ambushing them. The usual Soviet tactic of blanketing an area with artillery to supress enemy fire had destroyed many of the SENtenELs that had already fired their missiles and left the still active machines untouched.

The resulting confusion slowed the spearhead enough for the Germans to at least partially deploy and thus avoid being wiped from the map. Two first echelon Soviet tank divisions 'swept' the Gap to clear out what they still thought were NATO troops with anti-tank missiles. Meanwhile every time AFV came into the SENtenEL's radar field it was attacked. Success rate was 95%, and the result of each attack was another area blasted by the Soviet forces in an 'overwatch' position further back.

It took three hours to clear the area of machines, by which time the German Leopard tank divisions had swung around and started to attack the on-coming Russians thus slowing the advance.

Later in the war, on March 18th, the Soviet 1st Guards Army was caught by the second SENtenEL enplacement west of Nurnberg and lost 17 T-72s to the missiles before they realised what was happening. Unfortunately, for them, a squadron of Lynx attack helicopters caught their forces still in confusion, and between them and the British Harriers no less than 150 vehicles were lost in seven hours of protracted battle, before Foxbat interceptors drove the NATO planes off with heavy losses.

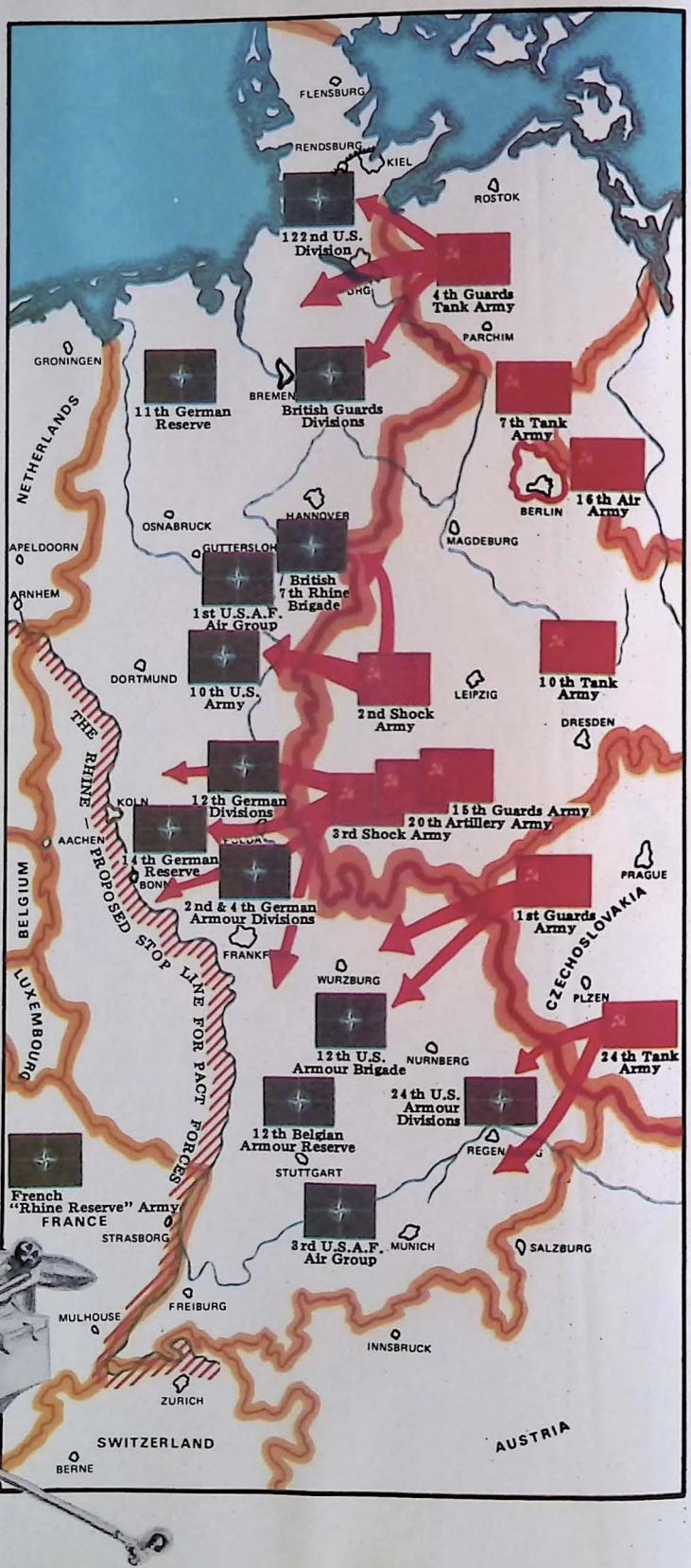
Air Power Becomes All-Important

This brings us onto air power and its role in the conflict. At the outbreak of the war both sides had been engaged in updating their forces. NATO's main fighters were the American F15C and F16D, backed up by Tornado ADV (Air Defence Variant) and an assortment of other aircraft. The British relied mainly on the Tornado and

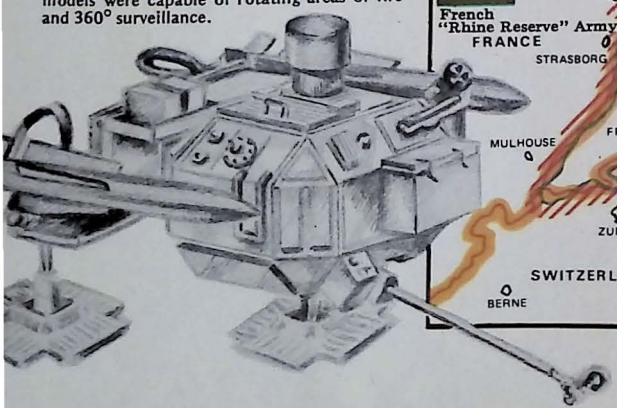
11th March 1989

The Initial Position

This sequence of four maps shows the troop dispositions at the crucial points in the conflict. Russian flags have been used to denote all Warsaw Pact forces, for reasons of clarity. Where possible NATO units are named and all designations are the most accurate which can be determined from this point in history. Arrows are used to denote intended attacks, and the front line is always shown in red. The first map (right) gives the initial disposition and the directions of the primary Soviet thrust lines. Note that the main attack, through the Fulda Gap, did not come until the morning of the 12th until the German armour in that area had been subjected to an intensive ECM and air bombardment. NATO's line came very close to breaking in the centre and it is probable that, if not for the success of the air forces on March 15 in decimating the Third Shock Army's supply lines and destroying the covering Backfire and Foxbat squadrons in a dawn strike, the Soviets would have reached the Rhine after all. All armour reinforcements reaching Germany between the 12th and 19th were pushed into the line in the centre, attempting to stop the Soviets splitting the entire NATO battlefield in two.



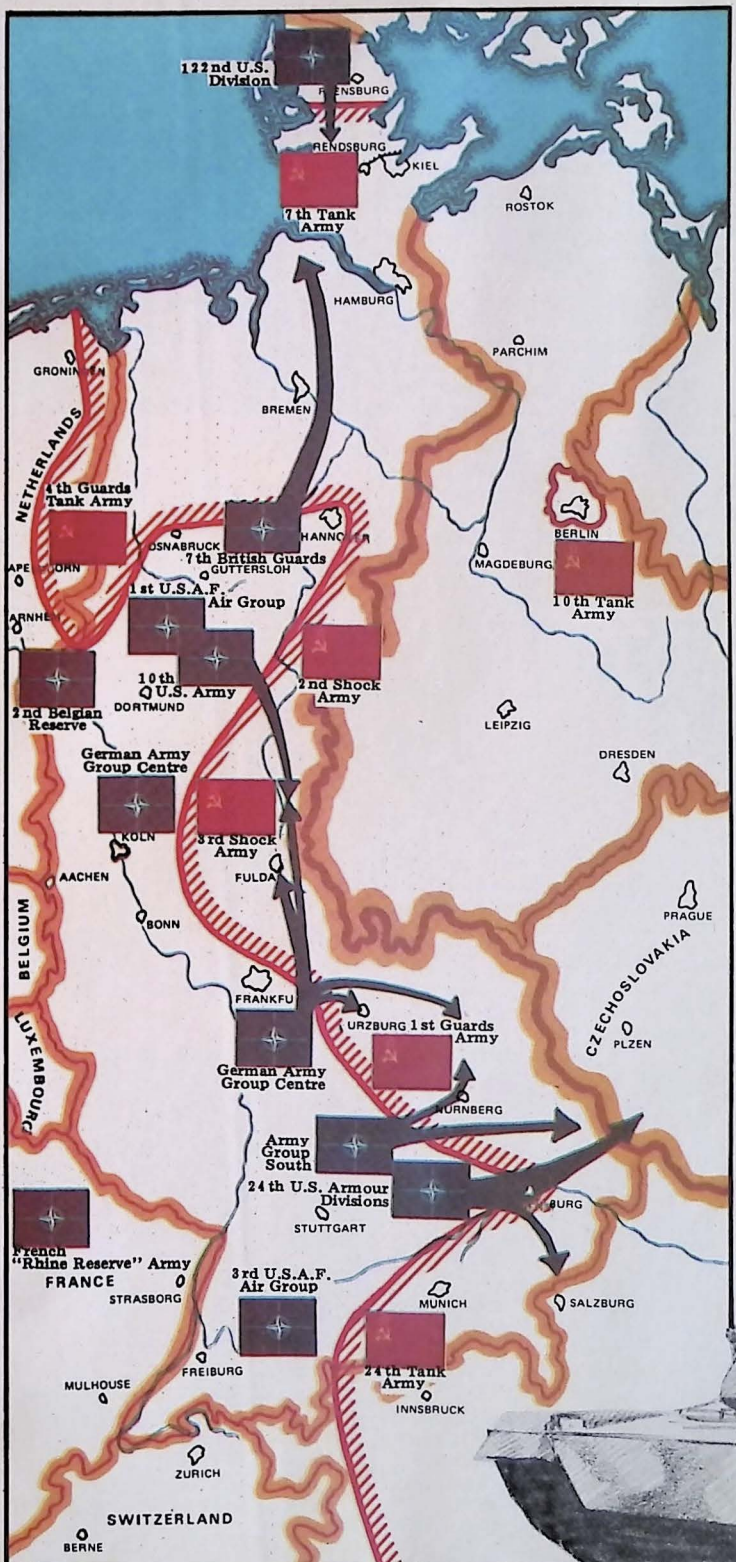
Below: Ministry Of Defence drawing of an early model SENtenEL tank killer. None of these Mk1s survived the war. It is this machine which blunted the Soviet attack at Fulda in the opening days of WW3. The Mk1 was armed with two Flashback anti-AFV missiles with a kill-range of 2000 yds. Once fired the missiles were auto-homing. The SENtenEL was capable of identifying over 20 different vehicle types and launching attacks with a success probability of 95% at 1000 yds or less. They were usually deployed along the edges of wooded areas, or in bushes. Later models were capable of rotating areas of fire and 360° surveillance.



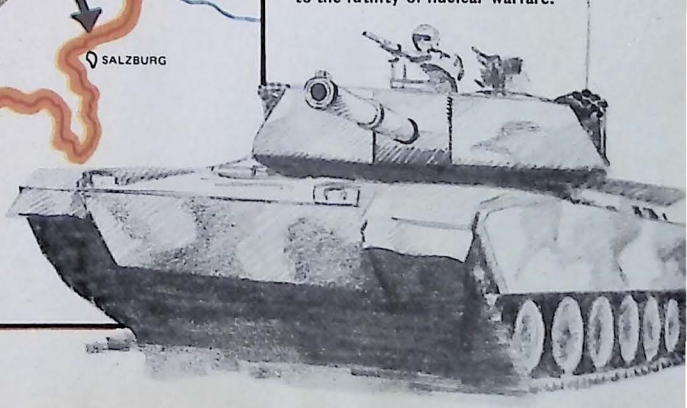
20th March 1989

Maximum Soviet Incursion

This is as far as the Soviets got in the nine day assault. Once the invasion was seen to have failed in its aims, the Pact forces halted in place whilst the Kremlin considered. NATO counter attacks are shown in blue. Note that all failed to achieve their aim against very determined Soviet resistance. At this point the Warsaw Pact forces were undoubtedly strong enough to hold their ground, if not to expand the gains against stiffening NATO lines and total NATO air supremacy. However with the continuing influx of American materials and multi-national troop build up the Soviets could not hold their superiority for much longer. One almost certain consequence of continued aggression would have been the annihilation of the Hannover pocket. Here the British Guards Divisions held on to the city against incredible odds, aided in no small way by the 1st USAF Air Group based near Guttersloh. With an almost total air umbrella they were able to continually repulse massed Soviet attacks, but could do nothing about the closing pincers behind them.



Below: An American XM1E battle tank. This formed the 'backbone' of NATO armoured resistance during WW3 and repeatedly proved itself superior to any Russian AFV it was faced with in combat. On March 26th it was an XM1E force which suffered devastation by nuclear attack at Plzen in Czechoslovakia. The vehicles have been left in the position they were attacked to this day as a grim memorial to the futility of nuclear warfare.



Harrier forces built up in the early eighties, although the three F15 Eagle squadrons stationed in Britain did nothing to weaken her air defence.

Early deliveries of the F18 Hornet to Belgium, Germany and Netherlands amounted to some 120 craft by March 1989 although not all were fully operational and thus undeployed.

The most capable of all the NATO planes remained the Eagle (F15C), now heavily modified and up-gunned with increased ECM since its first appearance some ten years earlier. The greatest improvement had been the addition of a Marconi 'short-scan' radar which designated targets for the Eagle's missiles in a manner designed to minimise detection. The ARG-17, which had been chosen previously, was found to be easily utilised by Russian RH (radar homing) missiles and had cost the Israelis some 12 aircraft a few years previous to the outbreak of hostilities in Europe.

The Eagle's ECM capabilities now included 'chaff' missiles – small pieces of aluminium foil fired out in a cloud to confuse radar homing weapons – extensive automatic jamming capability and a sophisticated air attack radar which was probably the best in use with any air force in the world. It is easily capable of designating and tracking over 20 targets simultaneously and initiating automatic defence of the aircraft when required.

Several ground-attack aircraft were in operation, most notably the A-10 and the ubiquitous Harrier. These had stood the test of time very well and kept ahead of developments in weaponry such as the Soviet ZSU radar-tracking anti-aircraft AFVs and the SU34 – a copy of the A10 itself – which the Warsaw Pact had only recently deployed in strength.

For the Soviets their MIG 25/29/30 Foxbat and its derivitives were still the major aircraft. The craft was based upon a very large airframe and was thus capable of carrying huge payloads. Its ECM was nowhere near that of any of the NATO front-line craft, but was adequate against older airplanes and missiles, but its armament was a good compensation.

As mentioned previously one new application for the MIG 29 variant was an 'overwatch' function to protect the SU34 tank destroyers by use of a powerful 'look-down' radar to confuse and distract the anti-aircraft gun tracking systems with an impossible target.

The Foxbat remained the only Soviet craft able to carry the AA12 Acid air-air missile which rivalled the Phoenix type used by the USA F14 Tomcats (amongst others) in performance but was twice the size and weight limiting its tactical value to an important degree.

In the battle for Hannover which was miracuously held by the British Guards Divisions and units of the US 10th Army the NATO airforce was primarily able to defeat the Soviet Air Force due to the superiority of their planes in the dogfights for which they had been bred and the use of the longer range air-air missiles for interception duties such that it was possible for NATO craft to take out incoming attackers without the need to put themselves at risk by engaging at close enough range to be attacked themselves.

Hannover was subjected to continuous air attack, as were the forces surrounding the city. The attacks were usually carried out by Backfire bomber squadrons from front-line airbases in E.Germany. However as the days passed and these airstrips took a steady beating from the Harriers and F111s of NATO's strike command, the Backfires had further to come and could be detected earlier as they flew high to avoid their own missile defences. This meant that interceptors could be despatched to meet them before they dropped down to a low altitude high-speed target approach run during which detection was difficult.

The Tornados were particularly successful at this, especially in poor weather, when their semi-active missile systems could be fully utilised. This type of weapon operates by use of a high power radar fitted to the interceptor itself, which 'illuminates' the target for the missile to home upon. Once close enough internal guidance takes over and guides the weapon to term.

AWACS

Fine control of front-line aircraft, on both sides, was best effected by use of AWACS (Airborne Warning and Control System) planes. These were adapted bombers/airliners whose huge airframes had been literally packed with electronic information gathering and counter measure equipment. Their links to each fighter is supposedly ultra-secure and from their high flying patrol position they can overlook large areas of airspace from a large, and therefore safe, distance.

Both airforces were naturally very keen to knock down the opposing control aircraft in order to make their own attacks upon enemy territory harder to counter.

At the outbreak of war, NATO had some 20 AWACs craft in positions from which they could be of assistance to the air forces over central Europe. Russia had 32 TU126 Moss (ex-bombers) deployed along the borders. Within a week losses on both sides exceeded 50%, and things were being stretched a little thin across the NATO lines.

MARCH 13: Commanders of the Fourth Soviet Guards Army take the salute from their victorious forces in the streets of Hamburg. Statues on the City Museum provide a striking counterpoint to the airborne armour on the streets.

For example at the time of the Aachen attack, March 16th, NATO had only two AWACs in the correct postion. The approaching Backfires were only detected when they crossed the missile belt at well nigh Supersonic speeds. By the time the intercepting F16s caught them they were returning home after delivering a devastating chemical and explosive attack upon what the Soviets believed was the 14th Armour Reserves XM1 tanks. In fact there were no armoured forces in Aachen at all, and the town was completely devastated. Eleven of the Backfires were brought down by the F16s.

On the following day the Belgian Air Force mounted an attack on the four Russian AWAC craft in the air whilst four squadrons of Harriers, F111s and supporting Eagles and Tornados swept across the borders into Russia in a reprisal raid. The city of Orel was selected as being of approximately equal population, and the strike craft carried sufficient arms to inflict a suitably savage and direct response to the Soviet devastation.

The Belgian F16s attacked the first Soviet AWAC at four in the morning, three of them engaging the protecting Foxbats at close quarters to negate the latter's greater range missiles. The F16s' manoeuvreability allowed them to get into position against heavy ECM and missile assault and in the ensuing battle NATO brought down the MIGs successfully. MIG 27 Floggers, more suited to dealing with the F16s, had been called up to intercept but could not prevent the Belgians successfully destroying the TU126s with infrared range missiles and — in one case when that failed — cannon fire. Nine F16s were lost in the operation and several others severely damaged.

The strike force, however, was not detected until it was over Russian territory, and sufficient aircraft reached the target to destroy it. Tactically the exchange was a defeat for NATO, whose losses totalled thirty-eight aircraft and the thousands of civilians killed in Aachen, but the point had been made, and area bombardment of civilian areas was to be avoided by both sides, where possible, throughout the war. Also the destruction of the Soviet AWAC craft severely hampered Pact airforce operations and went someway to redressing the imbalance in numbers of aircraft available to the two sites.

On March 19 NATO high command released 70% of the aircraft which had been held back for possible nuclear reprisal duties and the air war began to go the way of the West, despite NATO's continual attrition both on the ground and in the air.

Naval Operations In World War Three

Despite the growth in Soviet naval forces throughout the seventies and eighties, their Navy was unavoidably hampered by lack of ready access to Atlantic ports. Since most of the war materials flowing into Europe would come from the USA across the Atlantic 'air-bridge' this is the very spot at which that naval power could be best directed by the Soviet military command.

NATO had long taken widespread deployment of the Soviet fleet as early warning of an impending major military action, and any attempt before the war to move large numbers of ships into the sensitive Atlantic and Mediterranean would trigger sufficient suspicion to make surprise attack impossible. The Soviets therefore decided to accept the tactical disadvantage of not deploying their fleet, preferring instead to keep activity at a level which would not arouse NATO's suspicions prematurely.

The only major Soviet naval force in the area at the outbreak of hostilities was thus a 'Kildin class' destroyer flotilla on a 'goodwill' visit to Cuba. This promptly 'vanished' on March 12 and wrought considerable mayhem in two air convoys, before being neutralised by British submarine attack. 'Over the horizon' missile capability in both sides meant that any large scale fleet action would more resemble Midway than Jutland.

As it transpired the rapid deployment of British, American and French vessels prevented any chance of a major 'breakout' of Soviet ships, and the speed with which the war came to a conclusion was probably instrumental in ensuring a largely 'non-naval' conflict.

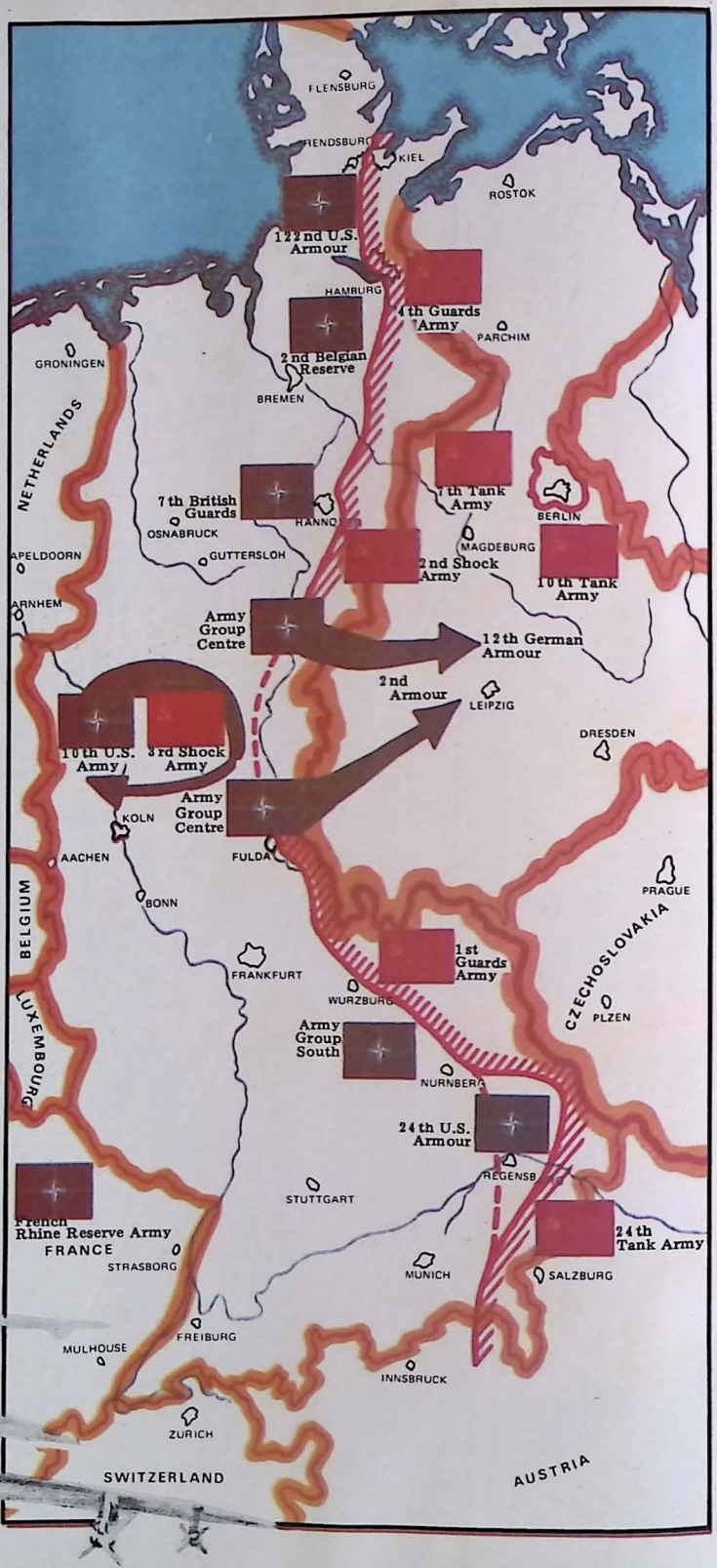
Such minor actions as did occur took place mainly around Denmark during NATO's extensive minelaying operations. Minesweeper forces clashed several times, and losses on both sides were fairly heavy. NATO lost seven destroyers and four minelayers (all to air-to-surface missiles) and took two Soviet cruisers and a destroyer in return.

MARCH 11: Elements of the Third Shock Army advance cautiously into a SENtenEL field. A T-82 burns in the background, and both vehicles 542 and 545 were destroyed within minute of this photograph being taken. Older T62 and T54 tanks were later employed to 'sweep' the area clear, as their loss could be deemed to be more acceptable.

24th March 1989

Attempted Pact Stop Line

The red "front line" shown here is almost exactly the "new frontier" which Moscow attempted to impose upon Europe. The dotted line shows where things went wrong — mainly due to the failure of the Third Shock Army to hold the centre when retreating. Otherwise the Soviet forces fell back in perfect order, and NATO's disruptive attacks were totally ineffective. The Pact forces themselves put the Third Shock Army into a salient, by reordering their lines under heavy air attack. Army Group Centre forces attacked it on either side whilst the 10th US Army engaged the main force. On the 24th a commando attack by the SAS disrupted the communication and command control to an unprecendented extent and severe ECM hampered the Soviet response such that the 10th US Army was able to complete an encirclement, incurring heavy losses in the process. The Soviet line now stood broken, and it is here the unfortunate incident that led eventually to the end of the war occurred. The 12th & 2nd German Armoured Divisions broke from Group Centre command and exploited the breakthrough. Immediately the border was crossed, Soviet tanks rolled into W.Berlin — up to now curiously bypassed by Pact forces. It has remained in Soviet hands ever since.

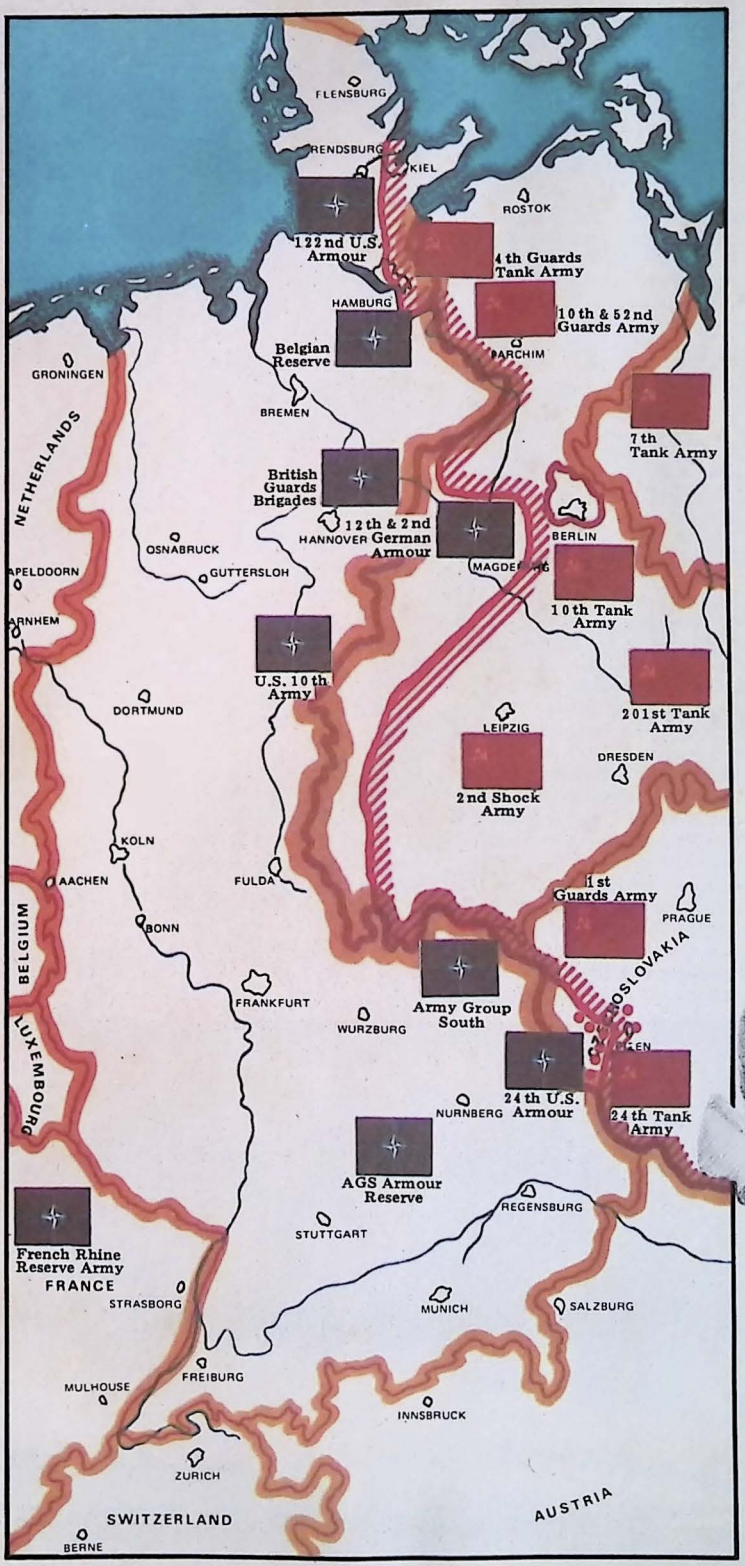


Below: SAAB JS37 all weather interceptors of the Swedish Air Force which were heavily involved in the attacks upon Russian AWAC aircraft. On this version up to eight radar homing or heat seeking missiles can be carried, and a 20 mm cannon is fitted within the fuselage. In action they proved no match for the Foxbats with their massive Acid missiles.

26th March 1989

Position At Time Of Nuclear Exchange

The position at 14:00 on March 26th, when the nuclear exchange took place at Plzen. Nuclear blasts are indicated by red circles. After the British & American refusal to enter E.German territory had been seen to be effective, the German calls for assistance to the 12th & 2nd Armour went unheeded. Eight fresh Soviet divisions were withdrawn from the Sino-Soviet border and sent to 'fill in' in front of the Germans. Madeburg fell to the 2nd Division, at a cost of 70% losses, on the 26th. Meanwhile the 24th US Armoured Division had crossed onto Czech soil — with the consequence that it was nuked. Following the exchange, and the subsequent Czech isolation of Soviet forces in their country, it was the Kremlins ultimate nuclear threat which ended the war.



Below: A detail taken from the 'Memorium' series of paintings by D.Rincon and hanging in the War Museum in London. This figure is believed to represent the continuing need for infantry, despite almost total mechanisation of warfare, to occupy and hold tactical positions. Soldier based upon American marine, circa 1985, in anti-laser reflective garb.

The intelligence ship Vladimir Komarov was attacked and severely damaged by two F14C Tomcats of the USN on March 20th while running for port somewhere in the Baltic. This vessel was believed to be the centre of operations for the 'hunter-killers' which knocked out NATO's observation satellites early in the war. Her appearance at this position without air cover is believed to be a major Soviet error — probably arising from confusion as to which squadron should have been guarding her at the time of the attack.

The escorting destroyers shot down one of the Tomcats, but received several hits themselves. Following this incident the Kiev aircraft carrier and her two sister ships managed to keep the Americans at bay sufficiently to ensure a stalemate in the area with neither side taking undue risks.

In the Atlantic such shipping as was lost was sunk mainly by submarine attack, which proved to be still the most difficult to defend against. Losses were heavy, but never at a level which was such that it could be termed "unacceptable" to military leaders.

The Nuclear Nightmare Is Realised

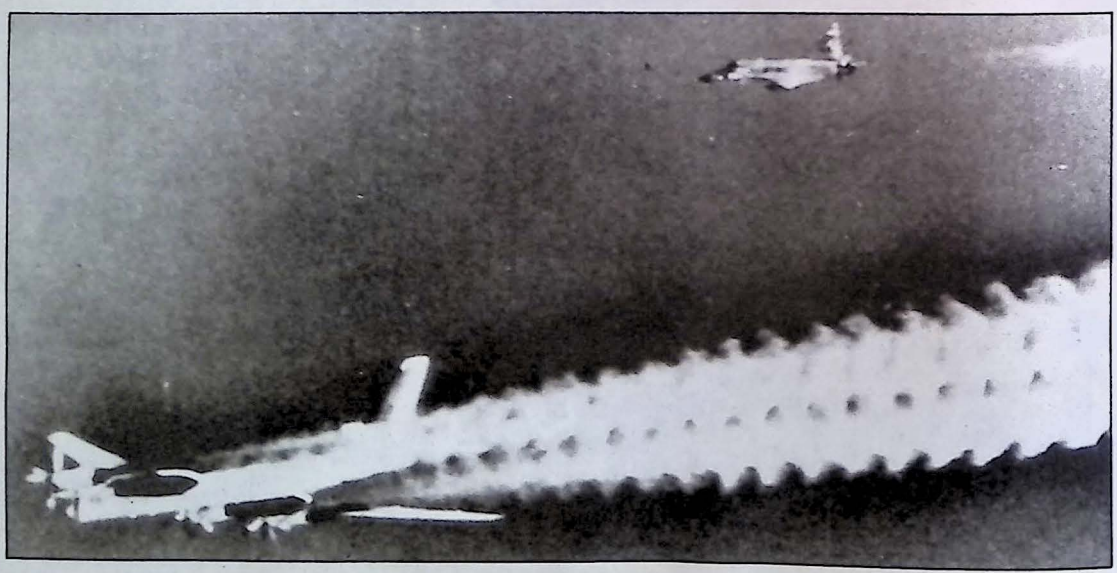
After the Soviet withdrawal to the original start line had gone awry and their Third Shock Army was isolated in W.Germany, Federal German forces raced through the gap so created, wrecking ground-to-air missile sites and pushing through the second-line forces stationed ahead of them. The Russians rapidly shifted the 7th Tank Army to cover the Berlin approach. In the south the American 24th Armoured Division pushed into Czechoslovakia territory, against orders, and assaulted the town of Plzen, pressing hard the Pact forces in the area.

With Britain and America refusing to send forces into E.Germany, Hamburg and Kiel still in Russian hands and some eight divisions of fresh Russian armour being rushed from the Chinese border into Europe the situation was becoming more and more confused and unstable.

On the morning of 26th March the Americans massed their armour, mainly XM-1 tanks, for a frontal assault on the Soviet Guards between them and Plzen. For some reason NATO could not at first discover why Soviet aircraft were conspicuous by their absence. Minutes later they found out. Seven 'tactical nuclear weapons' exploded along a four mile front instantly obliterating 150 tanks and killing 3000 men. A further 4000 were fatally irradiated and would die within a week at the outside.

The 24th was effectively destroyed, but more important the war looked about to escalate. An American retaliatory strike, using Lance missiles, wiped out most of the town of Plzen and about 40 Russian tanks. Both sides had now employed nuclear weapons and it seemed almost certain that further exchanges would follow as a matter of course.

It was the intervention of the Czechs which prevented this. Their isolation of Soviet forces on Czech soil, and refusal to take any further part meant that the Southern flank of the Pact was totally open to the American and German forces along the border. Further north the runaway German forces had taken Magdeburg and fighting was continuing fiercely.



It was the Kremlin ultimatum that ended WW3. If any further E.German territory were seized, nuclear attack upon the cities of W.Germany would follow. The fighting stopped and the talking began.

Eventually NATO as a whole bullied W.Germany into agreeing to the terms, but not before the 12th German armoured division had been wiped out in a massive tank battle west of Magdeburg when they refused to stop fighting. NATO as a whole stood by, and the bitterness still lingers in parts of Europe because of this final pointless engagement.

Summary

The published intention of the Soviets leading up to the invasion was to annexe the block of W.German territory east of the Rhine. By their own reckoning they had nine days to achieve this before NATO could be stiffened sufficiently by the USA to render a satisfactory outcome – without nuclear escalation – unlikely.

Once it became clear that they could not achieve this they settled for a large 'chunk' of land including Kiel, Hamburg and Fulda to which they began to withdraw. Thanks to the destruction of the Third Shock Army, and the subsequent rash action of W.German troops this was not held. The Soviet use of nuclear weapons to stabilise a rapidly deteriorating military situation at Plzen led to Czechoslovakia withdrawing from the Warsaw Pact and the effective loss of that territory to Soviet Russia and her forces.

And so the final gain to the Soviets was W.Berlin, and some 30 square miles of W.German land traded for the return of Hamburg and Kiel and the withdrawal of German troops from the huge salient created in E.Germany. (It is very doubtful if NATO could have held this territory militarily anyway.) They lost an enormous amount of prestige, and some 100 million Eurodollars paid to W.Germany in reparation.

It is very clear now that electronics was a vital factor in allowing W.Europe to survive the attack. It provided the means whereby the enemy could be identified and engaged successfully.

In the air war – which NATO won decisively – it outweighed the huge disadvantage of the West in terms of numbers and rendered it feasible for single aircraft to be assigned daunting tasks with a good chance of success and of aircraft and pilot survival.

With modern fighter craft now almost entirely automated, with the benefit of lessons learned in WW3, and RPFV (Robotically Piloted Fighting Vehicles) coming into service with Britain and America it is unlikely that, in the event of a fourth major conflict, human pilots would have anything but a minor role to play supporting the machinery.

The automatic SENtenEL tanks will almost certainly render large scale armoured forces unnecessary too, since their neutron-warhead missiles are effective against large formations and they can be safely assigned large patrol areas. They will be in full service by 2008.

Electronics may have been a major force in WW3 but in any future war it will probably be the ONLY major force. The age of the robot war machine is not coming – it is already with us.

Ron Harris
London,
November 1999.

MARCH 19: A SAAB of the Swedish Air Force follows down a burning Russian TU95 AWACS craft. The Belgian F16D which made the kill is hidden in the photo by the smoke trail behind the Russian plane. As the Soviet craft had violated Swedish airspace the SAABs had been the intercepting fighters, but were unable to deal with protecting MIG 29s alone.

My thanks to the Imperial war museum and the staff of NATO War Records, Brussels, for their assistance in researching this article. A more detailed account of the conflict can be accessed from Modmags on Indat 45681739072.

Birth Of The Information Age

Over the last twenty odd years the glamour and prestige once gained by those people who owned a 'home computer' has vanished. Compared with the systems that are available today the vintage 'home computers' incite more scorn than any other emotion. For those of us over the age of forty, the 70s were as much pioneering days as the times of the American West or of Stanley and Livingstone.

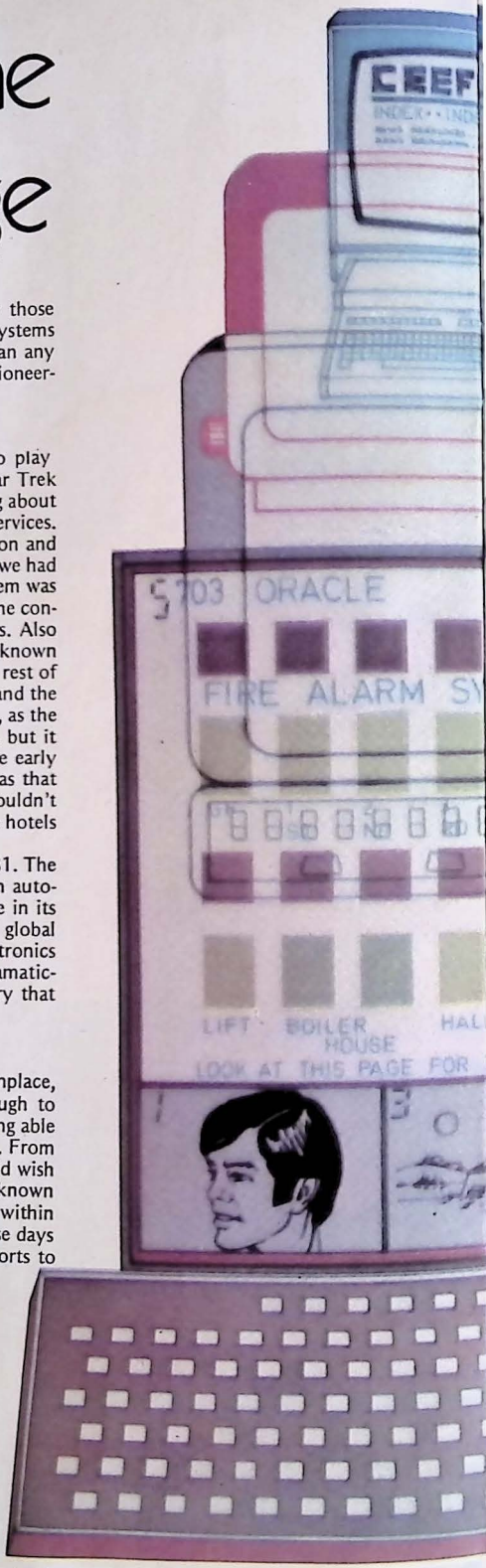
'Home Computing'

The whole concept of 'home computing' as we knew it then was to play around with microprocessors and systems, develop yet another game of Star Trek or do the accounts for the little shop around the corner. The staggering thing about those times was the almost total lack of interest in the existing information services. Technalogics, one of the pioneering firms in the field of bringing information and home computers together, had a system going as early as 1978. At that time we had Teletext available to us, what we now know as Channel 5. This "off-air" system was provided by both the BBC and the IBA as a free information service. All the consumer had to do was to purchase a suitably equipped TV and there it was. Also being developed, and released to the general public in 1979, was the system known as Viewdata. What was then the British Post Office succeeded in beating the rest of the world in providing an informatics network that connected the television and the telephone together, hence giving land-line access to a vast data bank. Prestel, as the BPO called it, cost the user money, not a considerable amount it is true, but it wasn't free like Teletext. This proved to be one of the factors limiting the early growth of the system. The second and much more fundamental problem was that our overpaid and underworked electronics industry, at that time, simply couldn't make enough sets. Prestel became a common sight in places such as prestige hotels and private company offices, but not in people's homes.

This situation changed dramatically between the years of 1980 and 1981. The BPO was reshaped by the Conservative government, and Prestel became an autonomous section of the British Telcom Network. Despite the poor response in its home country the system had been a major success abroad, leading to a global service in late 1980. This, as many times before, brought the Far Eastern electronics industry into the game and the availability of suitable TV sets increased dramatically. From this inauspicious beginning sprang the whole informatics industry that we rely on today.

Closed User Groups

As early as '83 the use of home terminals had begun to be commonplace, admittedly it was limited to those whose companies were farsighted enough to introduce Homework for their senior executives. The whole concept of being able to work effectively from home rested on the supply of suitable information. From the earliest days of Prestel it had been envisaged that groups of people would wish to store and access their own material on the system. To this end a system known as the CUG or Closed User Group had been built into the service. Members within the group naturally had access to all the normal public data, ranging in those days from the latest Stock Exchange prices through Consumer Association reports to British Airways timetables. However the public did *not* have access to the CUG's own data base material, making the system ideal for company reports to be circulated and amended within the confines of their own staff. Today, even whilst writing this historical article I shall probably assess more reference material on both the public 'net and my various private information 'net than I shall glean from written material. The final building block of what we all know as Indat was the development of Telesoftware. This began even when the only system available was Teletext, and was conceived as being a cheap and viable method of transmitting computer programs between users. In those days linking computers by telephone for private use was frowned upon by the bureaucratic giant of the BPO! Telesoftware was thought of as being a method by which the growing band of 'home



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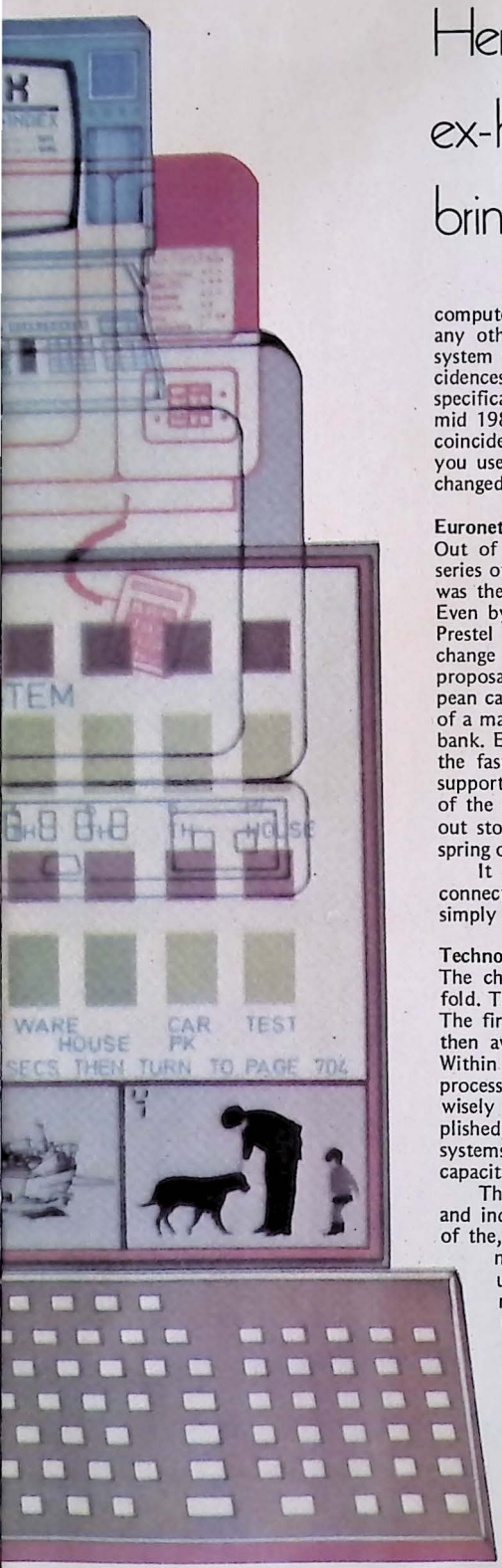
Henry Budgett, ex-home-computer-enthusiast, brings us up to date



computer' addicts could access a central software bank, much as they could access any other information. The system naturally spread onto the emerging Prestel system whereupon it promptly ran into the oldest snag of all – standards. Coincidences never look quite so surprising in retrospect, in late 1979 we had had a specification produced for microcomputer bus systems, then known as E78, by mid 1980 a similar specification had been produced for Telesoftware. What was coincidental you may ask. Well, amazing as it was then, both were seized upon and you use them today without even a second thought, the names have got a little changed though.

Euronet

Out of the great melting pot of the early computer addicts had arrived a series of innovative systems, ideas and proposed standards. All that was left wanting was the glue to stitch them together and that came in the proposal for Euronet. Even by standards then, Euronet was an old idea but the availability of Teletext, Prestel and a growing band of enthusiasts and far-sighted businessmen helped change the white elephant into a golden goose almost overnight. The original proposal was for a data communications network running between the main European capitals – mainly for government use. The whole concept was changed to one of a maximum free access information service, based on Prestel with a Telesoftware bank. Each member country had either bought a Prestel system or was using one of the fast growing band of competitor systems such as Teledon, and hence could support its own needs. The system swept aside all charges apart from the basic cost of the equipment and normal phone tariffs and the Information Providers leased out storage from the various member countries to maintain the database. By the spring of '85 the system was up and running in six European countries.

It was inevitable that the system should go along the lines of Prestel and connect up to both the US and the Far East. By the late '80's Euronet had become simply Infonet or just 'net as we call it today.

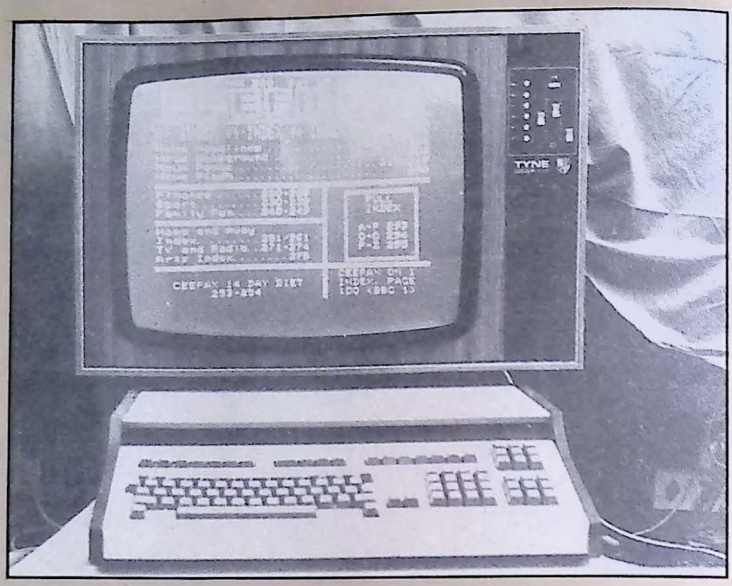
Technology

The changes that have taken place as far as technology is concerned are threefold. The first, and possibly most obvious, is the reduction in cost of the systems. The first Technalogics system was sold for around £2000, and was the cheapest then available. The technology it used was, by today's standards, rather crude. Within a year the system was being re-thought owing to the availability of new processors and cheaper, larger memory systems. Because the system had been wisely designed on an OEM style, changes to various sections were easily accomplished, the capability went up and the price fell. Within five years competitive systems were available based on a single board structure, offering vast memory capacity and greater power to process the information.

The second, and related, change has come about because of the acceptance, and indeed demand, that processors should be fully compatible. The acceptance of the, then, E78 bus system by the hobbyist and manufacturers caused a large number of truly interchangeable systems to be obtained.Because of this the user rapidly came to accept, if not demand, the system to have a full memory complement, multiprocessor capability – and hence still more memory, as well as full system software as part of his package.

The third, and most obscure, advance came when the BPO was split up. This removed a vast number of restrictions governing access to the telephone network, the general public could in short hook up their systems to the existing services. It also meant that the number of suppliers of equipment expanded at a vast rate.

A typical home terminal system nowadays combines several services. The basic television now uses a flat screen, removing the unit from mobility restrictions and allowing it to be wall mountable. All the televisions made since 1988 have included video terminal inputs and hence our operating console is the only connection. Fibre



Above. The original Technalogics home computer system with built-in Teletext and Prestel capability. Capable of being equipped with disks and printers it represented the first low cost intelligent terminal for home use. At the 1979 price of about £2000 it was a quarter of the cost of any competitors. Above Right. One of the early business terminals, this one was produced by Pye and called Visa. Output was black and white and it gave TV as well.

optics have advanced technically over the last decade and,because of the gross overcrowding in broadcasting, caused Britain to take 'cable' TV seriously. Surprisingly the use of FOLs (Fibre Optic Links) in the telephone field has been slow to expand. Interconnections between the television and phone systems installed in the home are however now generally fibre based. The average system allows control over Teletext (Channel 5) and Indat, as well as giving access to any other available on-line service. Many have the option of allowing home system control and reporting. The number of people engaging in Homework, including the author, is rapidly on the increase as a direct result of both fuel price increases and the simple fact that it is easier to work in your own way, than to commute to a hostile office environment.

Information Growth

Information available on-line today, via Indat, ranges from the standard Infonet service through normal number crunching machines to esoteric databases such as a wide range of scientific, industrial and educational material. Because of the in-built communications facility in each terminal one can transmit virtually anything from text (such as a letter or this article) to digitally encoded data from a scientific experiment. The header code on each packet will contain both the source and destination addresses which can be another user or even your own office's hard copy unit.

Data security has been a much discussed aspect of remote terminal operations. In much the same way as General Radio has each transceiver equipped with a unique code device, all commercial terminals today are built in the same manner. Not only does this allow each set to be traced in cases of fault or misuse but if you transmit a packet to a user whose terminal has gone down it will then use your own code to come back, thus telling you that it had not been received.

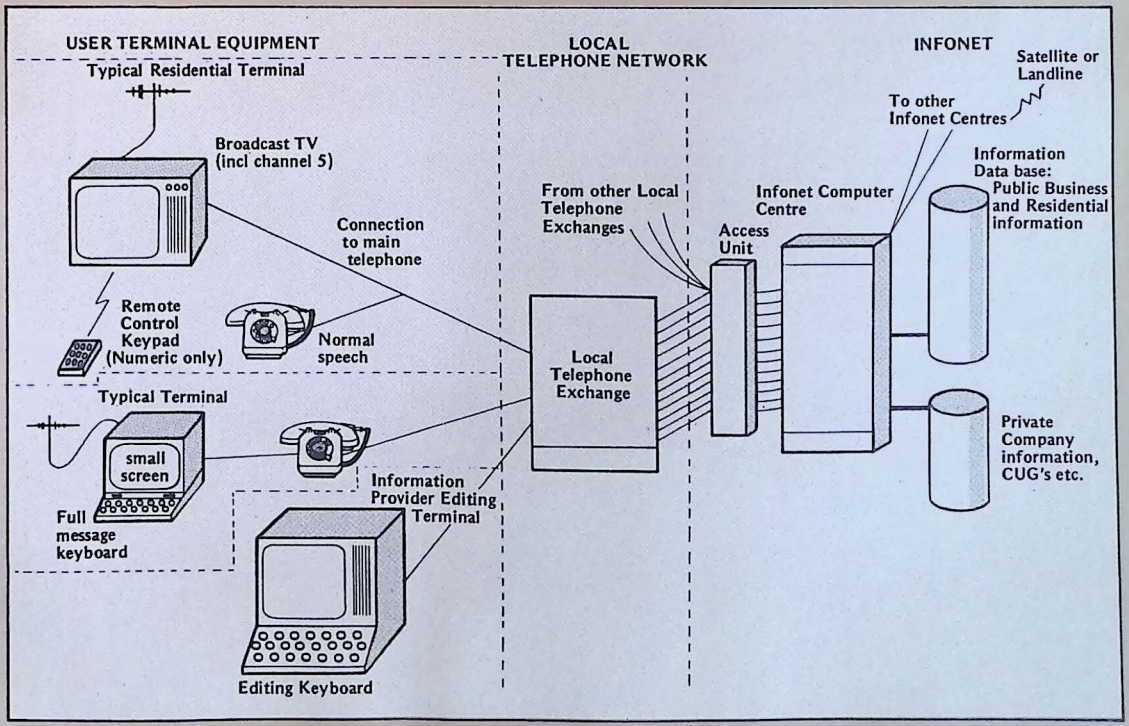
The second aspect of data security is coding or encryption. Once again most terminal manufacturers offer a standard encoding chip with the terminal. Standard encoding is a statistical oddity, the code structure is generally known but the time taken to break any given code sequence is around fifty years. By that time your data is probably going to be out of date anyway! For those with a high security data problem there are various software systems which are available but these do tend to cost more.

Because of the remote access situation people like myself tend to do almost all our routine work from home. The range of material on the 'net is so vast that I can generally access any given piece of data quicker through the terminal than by any other means. Although working at home is a better solution for me I still have to get out and meet people, and even go into the office once a week. When this article has been finished off to my satisfaction I will simply transmit it to the office where the team of sub-Editors will chew it about before passing it onto the comp room where the next stage is for the various printing instructions to be added. At this stage the whole lot rapidly disappears to the printers and is compiled into what will be pages of the magazine. As you are well aware there is a choice of

microfiche and film output as well as the standard text and Indat forms. I will get my revised text back for checking within twentyfour hours, direct from the printer of course, and then the whole process will be repeated until everything is correct. All of this is done electronically, and generally it will use a private 'Net for the in-house transmission and the public service for the inter-user transmissions.

Looking back on the last twenty years one feels a sense of regret for anyone who is just starting, they've missed all the fun. The social implications of the information explosion are enormous but in general I think it is fair to say that the Informed Society is better off today because of it.

Below. How the information gets between you and the systems. Although this is a much simplified diagram it shows the three main sources fo information and their connections through the telephone system to the main Information Centre. In this case we have shown the main Infonet computer but it could obviously be one of the many other public or private data bases. Communication between data bases can be either by land line or satellite link.




NEW YORK WEST
Nov. 12th 1999
14.30 hrs

This morning police released details of the arrest of a Dr. L. Niven, who was subsequently charged with :—

1. Unlawful possession of sensory data.
2. Kidnap with intent to extract said data (from one Miss Joanne Dee, 18, of NY West).
3. Assault upon the nervous system of said person.
4. Unlawful use of processing system.

and seven other minor charges relating to his apprehension.

What exactly happened is a matter for the justice monitors, but the police version ran like this : — one night in June Dr. Niven gained entry to Miss Dee's home by locally overloading the door monitor and abducted her under strobe induced hypnosis.

She was then connected, against her will, to a set of 'equipment' which recorded and stored her emotional reactions to the outside world as data on a disc storage system. This could then be replayed through appropriate decoders to allow Dr. Niven to experience himself the emotions exactly as had Miss Dee. In effect he 'stole' an imprint from her which he could later employ for his own gratification and/or remuneration.

When the police finally traced the girl — no-one can remain away from data terminals for long these days without inquiries being made — she had been missing eleven days. Dr. Niven had eight full discs of information neatly indexed and filed.

This is believed to be the first case of its kind in history and its implications are staggering. Theft, or unauthorised retrieval, of computer data has been a crime in the USA since 1991 (93 in Europe North) but these charges effectively extend that definition to the human brain.

Dr. Niven's equipment remains in police hands, but our own sources inform us that the principle involved employs the Kirilian effect — until now limited to photography. The hardware is nothing more than a standard 128K Z-8000 based domestic processor with a Texas 64K domestic interface. Coils of fine gauge wire are employed as record/replay sensors.

These coils are fitted around the wrists and forehead of the subject and pick up the violent changes in field strength caused by strong emotion. The generated EMF is then sampled and quantitized as an eight bit data stream for subsequent storage.

On replay the interface generates the corresponding voltage across the coils in order to induce a similar field and thus a similar emotion. Police volunteers who experienced the tapes were reported "very shaken" and totally convinced of the systems efficiency.

The case will have far-reaching effects upon our society and ETI will endeavour to keep its readers informed of developments.

Why Newton Crashed

Ian Graham reveals a new story of this space tug's crash

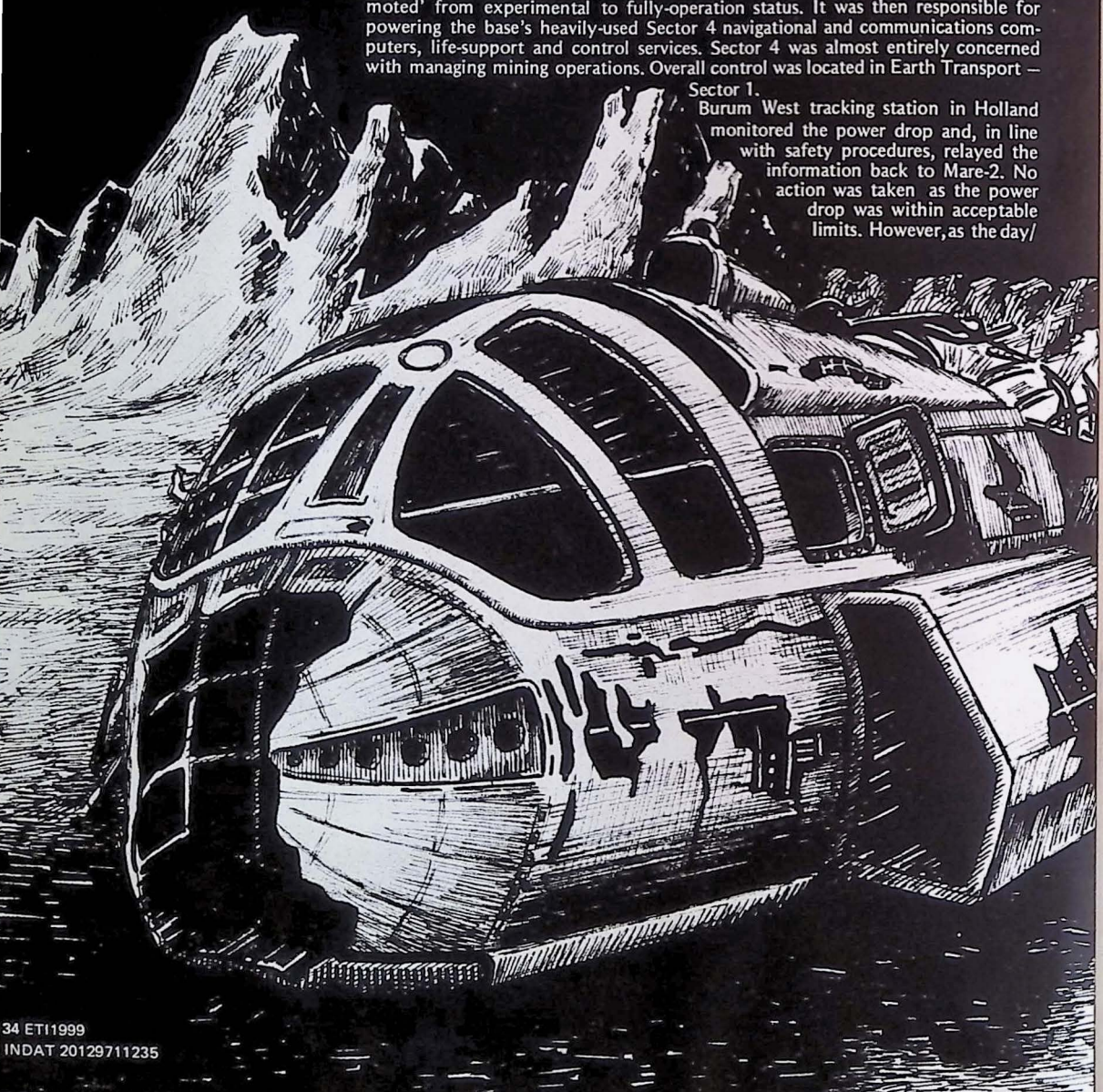
Mining operations on the Moon were thought to have been suspended since the crash of the Lunar Resources Development Corporation's (LRDC) space tug Newton early in 1997. However, the LRDC's new director, Charles Hessinger, revealed that mining was secretly resumed almost a year ago.

Press reports of the Newton's crash were conflicting and, it appears, largely incorrect. Even the Indat Centre in the ECR was deliberately fed with false information, the subject of a major investigation by the International Freedom of Information Commission last year. Now, in an attempt to clear the LRDC's name, Dr. Hessinger has published a new, 'truthful' account of the train of events leading to the Newton's crash, which killed all ten passengers.

Fusion Failure

On the 18th of January, 1997, engineers in Moonbase Mare-2 saw a drop in power from Fusion Plant 3. Plant 3 was the latest of the base's fusion plants to be 'promoted' from experimental to fully-operation status. It was then responsible for powering the base's heavily-used Sector 4 navigational and communications computers, life-support and control services. Sector 4 was almost entirely concerned with managing mining operations. Overall control was located in Earth Transport – Sector 1.

Burum West tracking station in Holland monitored the power drop and, in line with safety procedures, relayed the information back to Mare-2. No action was taken as the power drop was within acceptable limits. However, as the day/



The "True" Story?

night terminator passed over the base, plunging it into darkness, the output of plant 3 suddenly dropped to almost nothing.

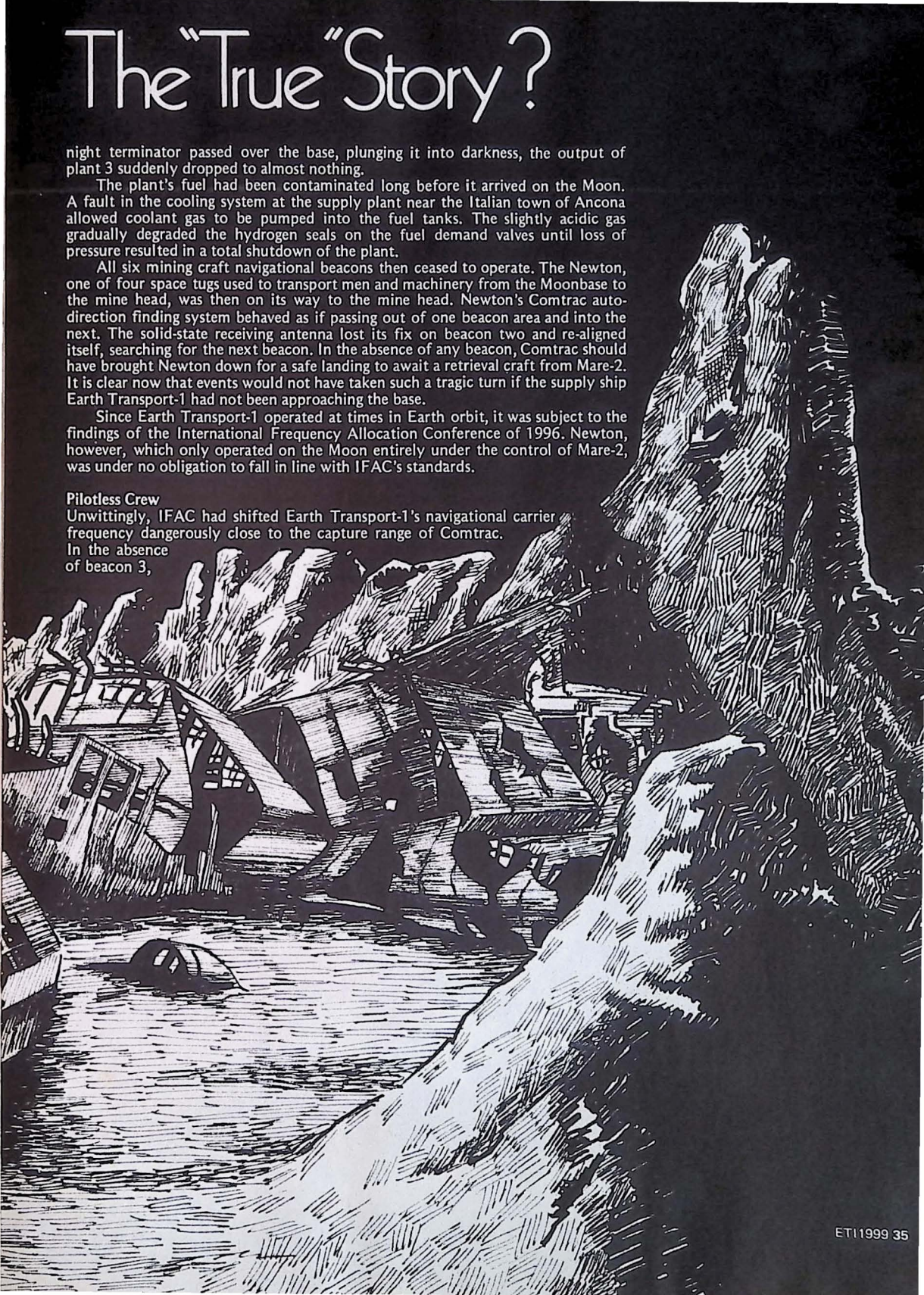
The plant's fuel had been contaminated long before it arrived on the Moon. A fault in the cooling system at the supply plant near the Italian town of Ancona allowed coolant gas to be pumped into the fuel tanks. The slightly acidic gas gradually degraded the hydrogen seals on the fuel demand valves until loss of pressure resulted in a total shutdown of the plant.

All six mining craft navigational beacons then ceased to operate. The Newton, one of four space tugs used to transport men and machinery from the Moonbase to the mine head, was then on its way to the mine head. Newton's Comtrac auto-direction finding system behaved as if passing out of one beacon area and into the next. The solid-state receiving antenna lost its fix on beacon two and re-aligned itself, searching for the next beacon. In the absence of any beacon, Comtrac should have brought Newton down for a safe landing to await a retrieval craft from Mare-2. It is clear now that events would not have taken such a tragic turn if the supply ship Earth Transport-1 had not been approaching the base.

Since Earth Transport-1 operated at times in Earth orbit, it was subject to the findings of the International Frequency Allocation Conference of 1996. Newton, however, which only operated on the Moon entirely under the control of Mare-2, was under no obligation to fall in line with IFAC's standards.

Pilotless Crew

Unwittingly, IFAC had shifted Earth Transport-1's navigational carrier frequency dangerously close to the capture range of Comtrac. In the absence of beacon 3,



Comtrac locked on to ET-1's navigational transmission and turned back towards the base. The crew of ET-1 reported seeing Newton fly over them and crash into a mountainside 400 metres beyond the base. There should have been a tug pilot on board to take manual control in the event of a major system failure, but months of faultless operation of Comtrac had resulted in a relaxation of the regulations. Newton's crew on that occasion was entirely composed of mining engineers, none of whom had any pilot training.

The crash was variously reported at the time as the result of sabotage, pilot error (despite the absence of a pilot) or failure of the control centre's remote landing system, which would have been used had Newton been landing at the base. The LRDC itself refused to make any comment, pending its own investigation. Dr. Hessinger has now publicly accused the corporation's last director, Francois Mourier, of deliberately covering up the incident, fearing that commercial operations on the Moon might be brought to an end if the truth be known.

Dr. Hessinger is confident that this will not happen. Since he became director of the LRDC he has not only brought all lunar craft into line with IFAC's frequency standards, but he has also scrapped the old Comtrac and replaced it with the more sophisticated military Navlad system. Navlad, now in service with the American third flight of pilotless aircraft in Germany, combines look-down LADAR (LAser Direction and Ranging), inertial guidance and reference star-plot. The new system has been secretly under test for the past eight months on the minehead tug routes from Mare-2.

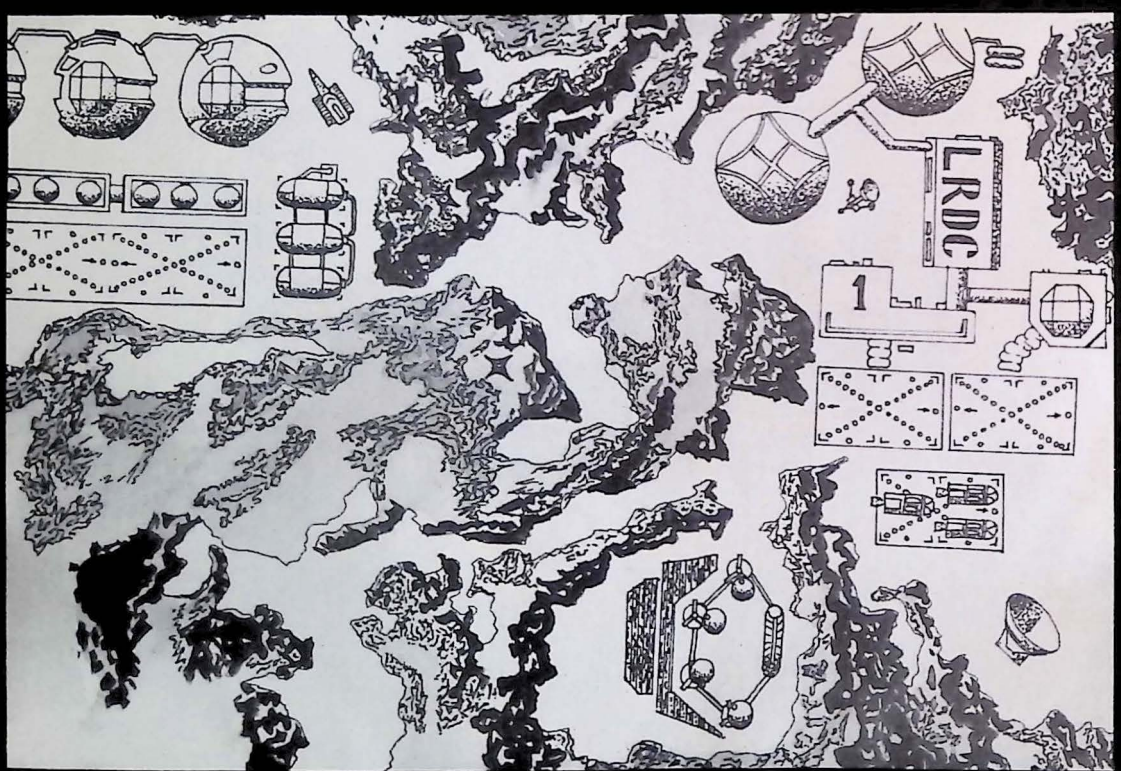
Navlad – Too Costly?

Dr. Hessinger has denied reports that the enormous loss of income and expense involved in replacing Comtrac with Navlad has driven the LRDC to the brink of bankruptcy. Although mining was suspended, the corporation was still paying the European Division of the North Atlantic Space Agency (NASA) an undisclosed monthly sum to charter their shuttle and Earth Transport craft to ferry essential supplies to the Mare-2's maintenance crews.

One must assume from Dr. Hessinger's confidence in coming clean now that the Navlad tests together with the new safety procedures devised by Hessinger and his team have gone well.

However, there is nothing to stop another Newton incident happening tomorrow. Yet the situation could so easily be rectified. At the stroke of a pen, IFAC's standards could be extended to cover lunar commercial operations.

A pilot's-eye view of Mare-2. The mountains form a natural protective wall between the experimental fusion reactors (bottom right) and the base itself (top right). The heavy metal mines are shown top left. Although they are close enough to the base for tracked vehicles to be used to carry supplies and men, the local topography makes short-range spacetugs quicker and more convenient. They are, however, much more expensive, requiring a team of experienced pilots, who keep the tug routes operating 24 hours a day. Each pilot is permitted to fly only 40 hours in every 140, with compulsory leave on Earth of one week in every six. Automatic surface ferries are now coming on to the market. Although they would require enormous capital investment, they could pay for themselves within four years. Indeed, they may become the only way to maintain profitable operations in future, if ore prices slide any further. Earth Transport craft arrive every three weeks at the landing pads (right).

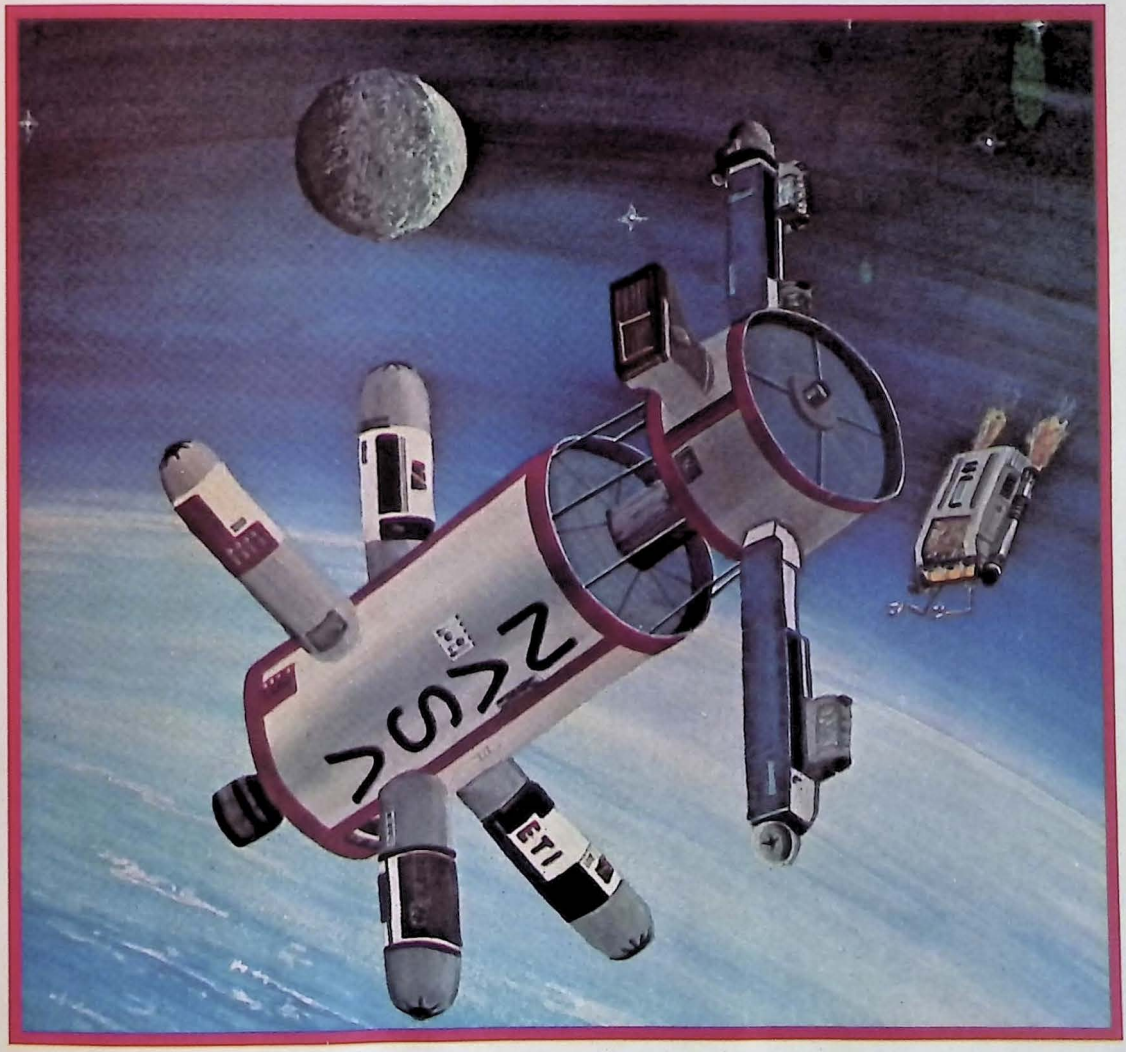


Making Rings Around Our Planet

Ian Graham finds a jeweller in orbit

Skylab-10 has now been boosted to a higher orbit, well outside the influence of the Earth's atmosphere and its full complement of four Extra Terrestrial Industries (ETI) modules are operational.

The station has seen a number of changes since it was launched two years ago. Originally it consisted of two converted fuel tanks, each 40 metres long and weighing in at 90 tonnes, joined end to end. The Power and Propulsion Module (PPM) carried three pairs of solar panels (one lateral and two diagonal) and the main engine. The main engine is an antique by today's standards. It's an old shuttle engine, beyond its shuttle operational lifetime, but still capable of occasional burns to relocate Skylab.



INDAT 61523707066

The original three pairs of solar arrays have been replaced by NASA's new high efficiency photovoltaic arrays, which produce more power from 30% of the previous working area. This has allowed the new arrays to be incorporated in the maintenance and rescue craft docking spars, which reach out on either side of the PPM.

The first ETI module followed Skylab-10 into Earth orbit only two months after its launch. It was delicately manoeuvered into position by two strap-on Close Manoeuvering (CM) engines controlled from the nearby shuttle Oregon. The operation nearly came to grief when a motor on one of the CM engines stuck momentarily with its throttle wide open, sending the ETI module spinning wildly end over end. After eight seconds the fail-safe engine control was triggered. The engine thrust itself was used to close a fuel supply valve, shutting down the engine.

This was the first Skylab to be opened for commercial operations. Manufacturing proposals were invited from companies in the Space Agency participating countries. Predictably, 95% of the applicants were from America and Europe North. However, one applicant, thought to be an outsider in the space stakes, was awarded an early place in the orbital manufacturing program.

Ringing The Changes

If you're getting engaged next year, your engagement ring may well come from Skylab-10. The Dutch diamond dealers G & F Schuckman (who also own the Mousener chain of jewellery shops) are to be the first European firm to participate in the Orbital Industrial Applications (OIA) program. The program has been used so far by American electronics and light engineering firms to produce semiconductor devices, high quality castings, and perfectly spherical bearings for military and research applications. The new British-designed SENtenEL tank uses exclusively zero-g titanium bearings in its turret assembly. The combination of zero-g bearings and high pressure CO_2 mountings allows the massive fifteen tonnes barrel and turret assembly to be driven by just two small electric motors, each roughly the size of a man's fist.

Moonbase Mare-2's high gain Earth communications antenna was used to relay data between Earth and Moon on the worsening power situation at the base. The antenna, designed by Tele-World in Canada, was the first major structure to be purpose-built on the Moon's surface. The structure, whose mass is only one sixth that of comparable terrestrial antennae, was ferried to the Moon in its component parts by Selenocraft – the forerunners of the present Earth Transport fleet. The antenna is used as a landmark by Earth Transport craft pilots, who still prefer to make a manual final approach with computer-assisted visual landing aids. However, using the minehead navigation beacon systems, the landing procedure could be computer controlled from de-orbit to touch-down.

The Schuckman brothers claim that orbital transport and unit processing costs have decreased to the point where it is now economical to make high quality jewellery using automatic production techniques specially developed for the OIA program.

Gold Bullets

After teething problems earlier this year, the system is ready to begin full-scale production. Magazines of finished diamonds are to be ferried to Earth orbit by an unmanned shuttle. The magazines are plugged into ports along the side of the space station. Meanwhile, the gold, in the form of 10mm long 'bullets', is liquified in an on-board solar furnace. The Sun's energy is focused on the furnace by a $60m^2$ array of parabolic mirrors orbiting some 100 metres from, and under the control of, the station.

The liquified gold is pumped into six reaction chambers into which the magazines also feed one diamond at a time. One early problem involved the correct orientation of the precious stones in the magazines. Rings were being returned to Earth from the first trials with stones fitted upside down. The problem was overcome by a simple modification to the shape of the probe which injects each diamond into the reaction chamber.

Each stone is held in a 3-part mould inside a pressurized cylinder. When the cylinder is evacuated, sufficient gold is sucked in from the furnace to make one ring. The finished rings are dumped into a capsule which can be collected by the automatic shuttle that brings the raw materials.

Unskilled Finishing

Although the rings require finishing by hand when they are returned to Earth, this can be done by unskilled staff. The Schuckman brothers will gradually reduce their present staff of 64 skilled technicians to two. The last two men will be responsible for designing and making the moulds to be carried in Skylab-10. The cash savings from almost completely dispensing with their skilled staff will enable Shuckmans to more than meet the costs of orbital production.

Jewellery production will only occupy a tiny fraction of Skylab-10's time, as each ring can be finished in approximately eight seconds. Within the next year each reaction chamber should be fitted with a different mould and the moulds will be replaced with new designs every fortnight, allowing Shuckman's to fulfill annual manufacturing quotas for their in-house engagement rings in only three months.

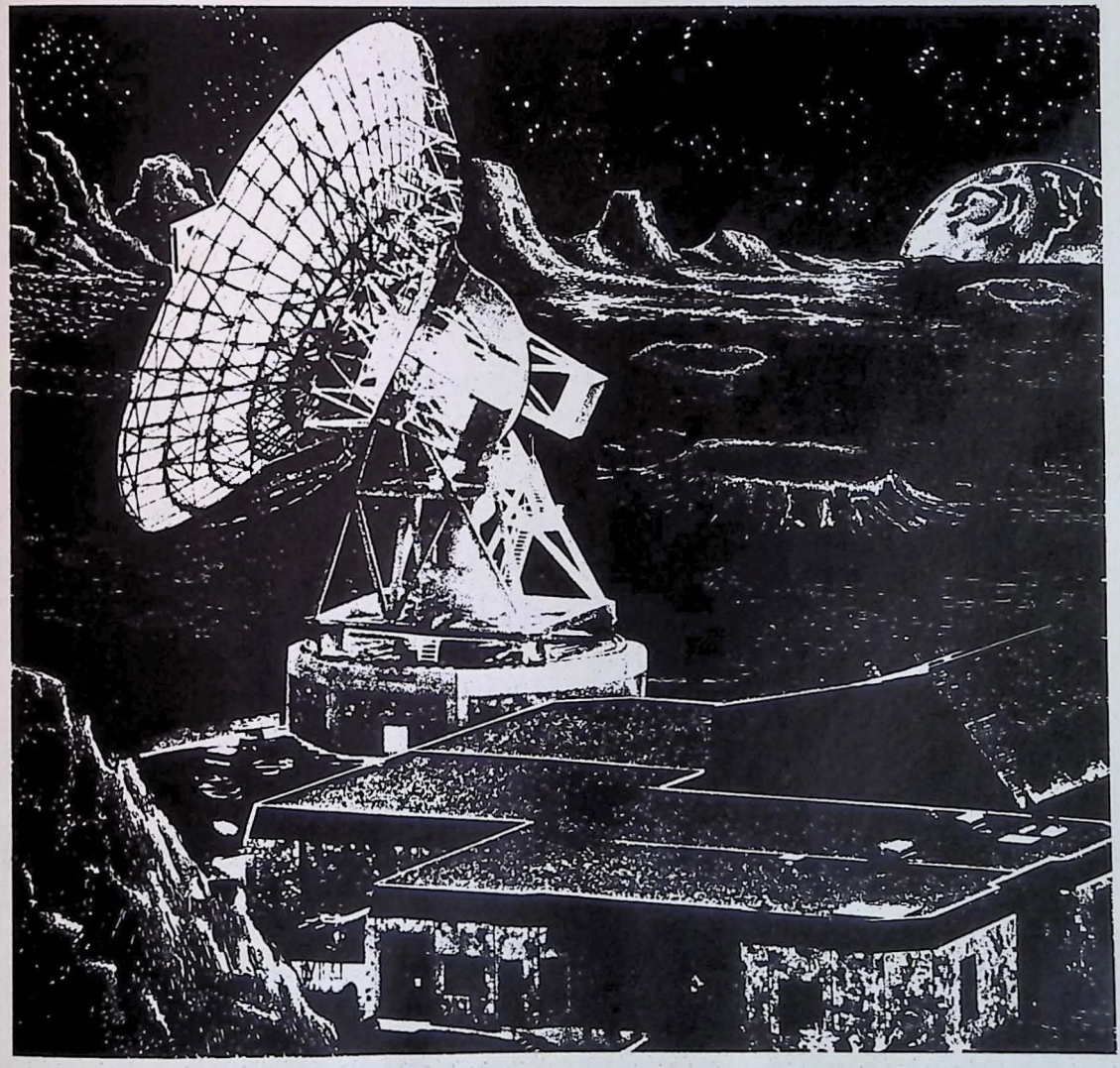
At present the system is designed to produce rings with a single stone, but trials are beginning now on a new multi-probe injection tool and magazines which should be capable of coping with several stones of different shapes and sizes. Ultimately, the rings will be finished automatically on-board Skylab-10, requiring only a final inspection on their return to Earth.

Power Sharing
Ring production does not continue for the entire fortnight. All reaction tanks are equipped with their hardware and raw material requirements at the beginning of each fortnightly operational period. Power is then allocated to each process according to requirements and available supplies.

Military Lion
Production of military spec PLAs still takes the lion's share of power. Almost half a million chips are produced each day. Each circular grid of substrate carrying 500 chips can be finished in only 40 seconds. The grid is then turned over and the individual chips separated off by two mutually perpendicular rotating-mirror lasers.

Skylab-11
Nasa's new target for completion of Skylab 11 is June 2000. There is already a waiting list for ETI Module Space, so, unless you qualify for last-minute consideration under the 'advancement-of-science' or 'medical breakthrough' clauses of Nasa charter, you will have to wait until January 2001 to file your application (for the 01A2 program).

We will shortly have access to the technical specifications of Skylab 11. To advance-order your copy use Indat 924371594.



Psycho Symph

Keith Brindley helps you think out loud

Thanks to the adaptation of a non-standard analogue/digital programming technique, now available on the ETI computer, we proudly present the latest in psycho-electronic musical effects – the ETI Psycho-Symphonia.

In the early part of this decade, work undertaken in the main psycho-electronic laboratories of the continent defined a new phenomenon on the electro-magnetic spectrum – the Omega wave. The project team involved in this enterprise were working on the theories and hypotheses given by the famous mathematicians, Albert and Stein, in their 1989 series of lectures which earned them a Nobel prize that year. The main postulate of their theories was that any creative thought in the brain would produce an electromagnetic waveform, which is of a certain frequency and magnitude, dependent on the strength and type of creative thought.

Therefore, a musical thought would have a waveform contained in a different part of the spectrum to say, a visually creative thought.

Within just a couple of years, the research teams had found the various spectra which emanate from the brain and grouped them all under the term Omega waves. Once the waveforms had been isolated and studied, the next step was to design a transducer to enable the waves to be identified as the bio-electronic product of the original thought, i.e, if we think a sound, then that sound will be given at the output of the transducer.

But, this seemingly simple task has proved to be one of the most difficult ever faced by some of the greatest scientists in the field, and it is only within the last two years that an answer has been found. So, because the process is still in the early stages of development, with only about 25% of the available orchestral instruments bio-recordable, the ETI Psycho-Symphonia is definitely one for the experimenter. You will find upon completion, that the device is capable of producing the simpler sounds of instruments such as the flute, piccolo and in some cases the violin – in other words, any instrument which gives a relatively uncomplex waveform. The more complicated the waveform, the more difficult it is to discern between sounds, although a few hours practice should increase the definition. (See footnote)

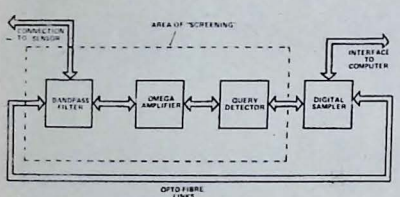


Fig.1. Wiring Diagram. Connect the four components with XG0072 FOL. A metal container has to be placed around the area indicated and this should be connected to 0V.

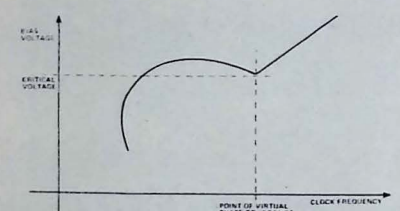


Fig.2. The 'Query Detector', which retrieves the audio from Omega waves.

Construction

The area within the broken lines in Figure 1, has to be 'screened' – a term which died out in the early '80s as digital audio and video techniques became commonplace. The term merely signifies that a metal container be placed around that part of the system and tied to 0 volts. This is necessary because to pick up Omega waves from the inherently non-digital brain operation, we have to resort to quasi-linear amplification techniques. We appreciate that it is a bit messy (but not half as messy as fitting a multi-pole socket in the skull), although with care you should have little problem. Remember, if you do need advice, get in touch with our computer and speaking slowly and clearly, in a broad Texan drawl, ask for our fault-finding program.

How It Works

The next section, formed by PLA 2, is an Omega amplifier which simply amplifies the Omega waves, whilst leaving all other frequencies unamplified.

The query detector is so called because of its foldback characteristics (not because we couldn't think of what to call it), of bias voltage versus clock frequency which is shown in the graph of Figure 2.

As can be seen, the device is linear at all higher biasing voltages but, at the critical bias voltage gives a virtual reversal of phase coherence, within the limits of the audio range that is. This stage gives a very low mutual bio-conductance output, and its overall effect is to change the signal corresponding to the inputted Omega waves into an audio signal, of varying frequency, amplitude and timbre, which can then be passed on to the next stage in preparation for store.

The digital sampler is a standard Brown trigger type, but with the added advantage of low I/P impedance – necessary of course to match the mutual bio-conductance O/P of the previous stage – the query detector.

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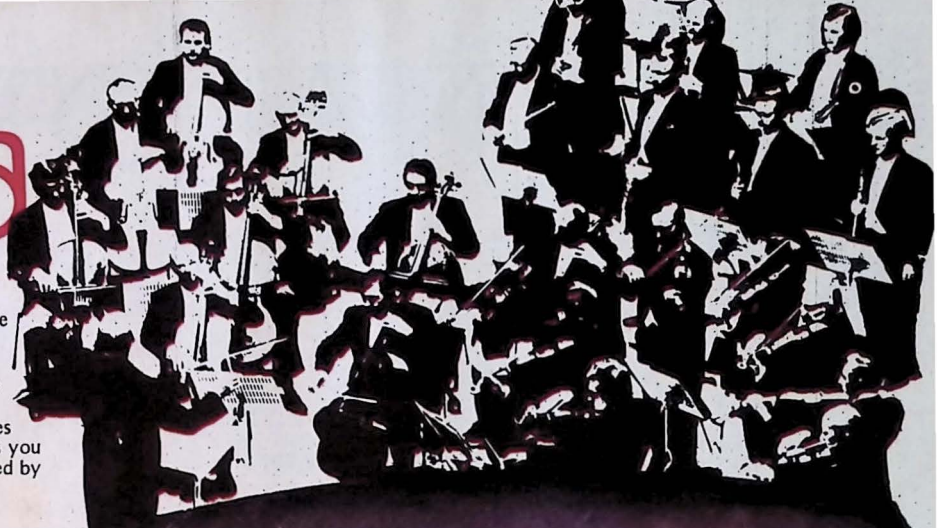


Setting Up Procedure
Position the sensor at the rear of the head, just behind the left earlobe, as this is the area of the brain which seems to produce the Omega waves and see what happens as you think of a sound produced by a musical instrument.

Footnote:
Previous to this important discovery, it was thought that the only way to produce waveforms corresponding to the brain's creative activity waselectro-neurally, i.e, with a direct physical connection to the brain using electrodes. This is, of course, quite a messy procedure involving brain surgery with only a 96% success rate, although the whole task is now a program-controlled computer operation developed by a team of the world's leading brain surgeons, led by Professor Zeal Angusto. The team specify a standard bus system directly interfaceable with the majority of available microcomputers. The main disadvantage is that the system entails insertion of a 32-way multi-pole socket mounted on the rear of the head. The electro-physical technique used in the ETI Psycho-Symphonia negates the need for any direct physical connection to the brain and is therefore much more favourable to the home user.

ON-AIR, OFF-AIR

Halvor Moorshead reports on the demise of broadcasting

'On-Air', the red-light warning in our broadcasting studios, may soon be a misnomer. In a major report (Indat 294174356) the Aldis Committee have recommended that only the 500 MHz below 2 GHz be allocated to TV broadcasting after 2020.

It says that FOLs should be extended to 99.6% of the homes in Europe North including those in isolated communities. Urban users should subsidise those in remote areas. Limited broadcasting of TV will still take place to cater for portables and mobiles and for those outside the FOL networks.

The Aldis Committee was set up to study the implications of System II TV, the proposed high definition television. This, as reported in ETI 9809 produces a picture with an aspect ratio of 8 : 3 (nearly cinemascope) with 1501 lines and with a frame frequency of 60 Hz. With a definition of 2300 elements per line each System II transmission will occupy 65 MHz – ten times the current bandwidth.

The broadcasting organisations say that they could introduce System II within two years of a decision on the transmission medium. Prototype equipment now sits in R & D labs ready for the day that legislation will make it safe to start manufacturing.

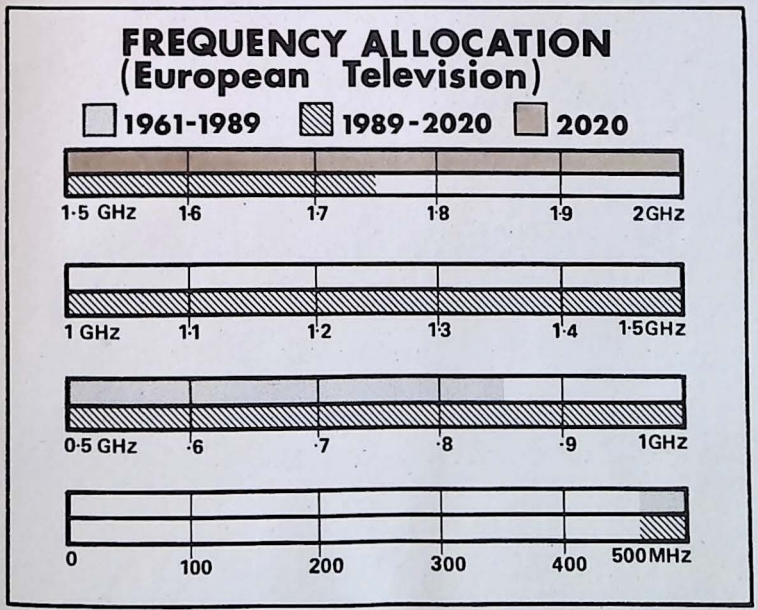
The Aldis Committee recommend that System II is adopted with whatever amendments to the technical specification are decided at the Chicago Conference to be held in January. At this Conference it is expected that the whole world will adopt System II as their 'second stage' system – that is with the exception of the French Region, who have their own plans and cheekily call theirs Systeme III (they have already gone ghrough the 819 and 625 line standards).

In the USA, the FCC has granted permission for the new standard to be used experimentally on cable networks and some manufacturers have provided TV sets with built-in standard convertors to enable existing transmissions to be screened on the new sets – albeit at reduced definition.

SYSTEM I & SYSTEM II COMPARED

In a 100 MHz band you can fit 15 System I channels or 1½ System II channels.

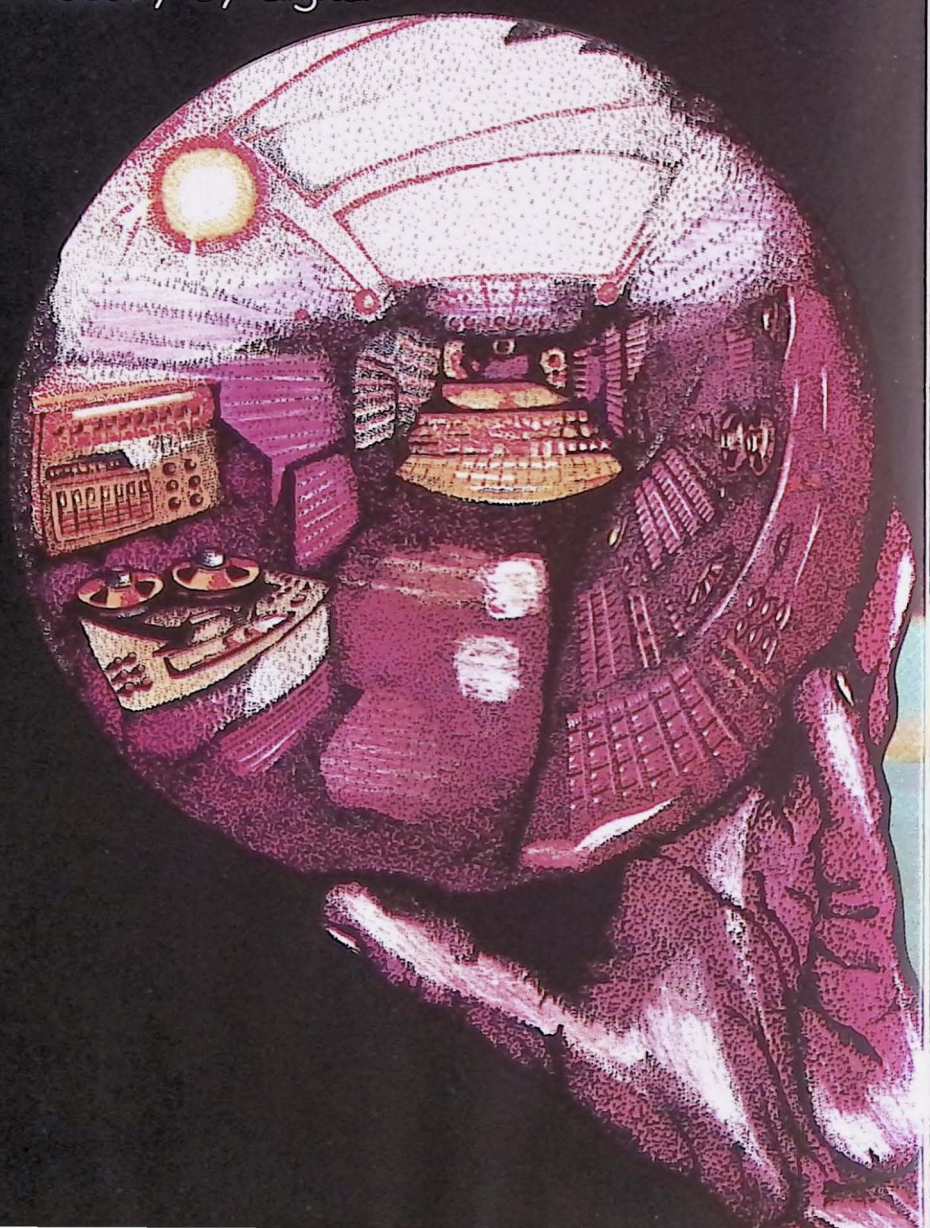
INDAT 65437256781



Above: Grey shading shows FOL areas (75%, or more, homes 'wired') in 1999. Brown areas show expected FOL coverage in 2010. It will probably be 2020 before the Aldis committee's get their wish for 99.6% of homes in Europe North fitted with FOL.
Far Left: Simple comparison of System I and System II, comparing definition/screen-size possibilities and bandwidth.
Left: TV broadcasting is taking over the RF spectrum, but when the recommendations of the Aldis committee are implemented, TV domination will be restricted to the 500 MHz below 2 GHz.

MUSIC IN A DIGITAL WORLD

Steve Ramsahadeo looks at the contributions made to the music industry by digital electronics



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As ideas and trends change, major developments in studio techniques are geared towards meeting the demands of musicians, composers and producers. This continual search for technological innovations has brought about the latest digital techniques now being used throughout studios worldwide. In this expanding industry it is of optimum importance that recording studios be well equipped, and provide up-to-date facilities, some of which we will take a brief look at below.

Recording Via Satellite

Here a kaleidoscope of talent can be merged from various countries into one recording. However, to gain access to this facility your studio must be a member of the Data Transmission Link for Recording Studios (DTLRS). This is by no means an easy task as requirements are high because the organisation is very selective with applicants. The DTLRS is an international body which administrates and allocates studio time related to satellite recording throughout the world. At present there are four satellites in orbit and each one is capable of handling transmission data from every studio based in N.America.

To illustrate this more clearly a good example was the musical presentation of the world premiere Recording Show the arrangers and producers decided to use four countries to get a touch of originality. Vocals were provided by the USA whilst percussion arrangement came from S.America, horns arrangement from Spain and strings from England, where the master recording and final mix was to take place. The process can be briefly described as follows.

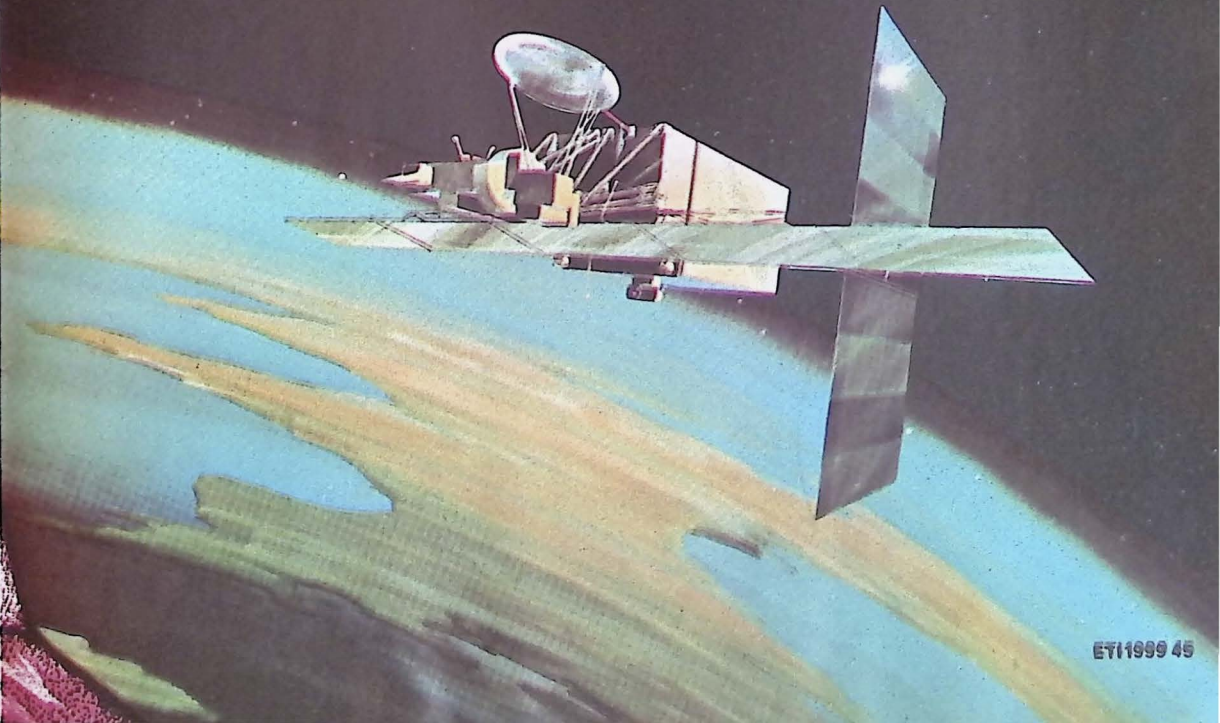
The analogue waveform is first converted to a digital signal and then transmitted using PCM (Pulse Code Modulation) techniques with a 16bit code, thus giving 65,536 quantising levels using a typical sampling rate of 50kHz.

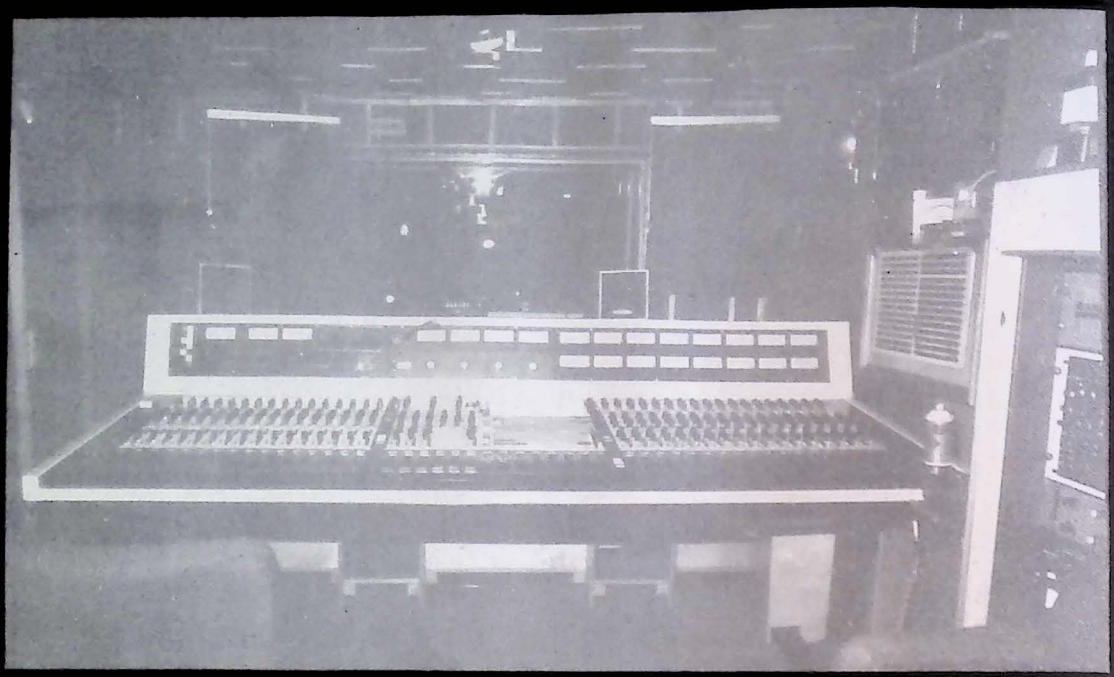
Each studio has an assigned code to open all transmission channels. The code to be entered must correspond to that in the computer memory on board the satellite, assuming all is well the necessary data such as track allocations, monitoring levels, synchronizing pulses etc. are transmitted using a bi-directional transmission bus.

Digital Synthesis

This technique has been with us for well over twenty-five years. The term synthesis is basically analysing the acoustic properties of the original sound and then recreating that particular sound electronically. The real advantage of synthesis is the creation of new sounds with no direct musical equivalent, this being more important than a technical analysis.

This process tends to dismay many musicians, because synthesized music had the uncanny habit of detracting from their skills as musicians in their own right. Therefore not surprisingly the ordinary listener gave credit to the 'advancement' of electronics and not the musicians capability.





To all you historians who remember such names as Ringo Starr and John Lennon, members of the Beatles, who caused a musical sensation in the early 60s well into the 80s. The 16-track mixer featured above was designed for Ringo Starr, it was on this console that John Lennon recorded his album 'Imagine'. The mixer can be seen at the historical Pop-Art Complex among other studio equipment used in the past.

However, the technique I am talking about is different, not only has it brought a fresh and creative look to present-day musical attitudes, but, more importantly there is very little or no loss of timbre. But the musician still has worries. Reproduction is of high quality and takes place automatically, with even more realism than the realistic! For this reason musicians feel they are an endangered species, desperately in need of protection from extinction. However, the story is not all gloom and despair; all you young musicians can breathe a sigh of relief (for the moment anyway).

Musical synthesis can be divided into two categories: the keyboard-input type, with which we are all familiar, and the computer-input version, using machines like the Synthola.

Despite considerable advances in humanisation software, designers still can't take the "mechanical" sound away from Synthola. Like the musical performers of early times who feared the introduction of the pianola, today's performers should be re-assured. Computer-performed music is for automatons, people need human musicians.

Synthesized composing: for this technique a light pen is used to draw directly on a video graphics monitor any musical notation (as found on a typical score). Obviously the input data is of a polyphonic nature, this is converted to a digital signal then allocated to pre-selected voice memories, e.g. strings, horns, percussion and woodwind sections. Any individual instruments from these categories can be called for and their parts written then stored. During composition any written piece can be recalled for correction.

When all routines have been composed they can then be played simultaneously by the Synthola computer.

Summary

To conclude, the recording industry has seen many changes, some of which I have just touched on. Other facilities that are available and in operation such as fully controlled touch mixing consoles, bio-feedback recording, digital and video discs, one wonders how many more weird and wonderful technological advances are to come our way!

I would like to express my thanks to the following for their assistance in preparing this article:

Simon Mortimer, Paul Graves
Atmosphere Recording Studios

George Balla
CBS Recording Studio.

TO SHOW HOW THINGS HAVE CHANGED OVER THE LAST 19 YEARS, BELOW WE REPRINT ONE OF OUR ADS FROM 1980 BESIDE OUR CURRENT LIST OF PUBLICATIONS.

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The New Millenium

As we enter the time-tunnel to the next millenium, we speculate on what we will find at the far end

This way for a new decade, a new century, a new millenium. In the next twelve issues of ETI we will lead you through the Year Of Transition into 2001. It will not be an easy journey: on either side of the path false prophets will tempt you with their short-cuts to Utopia. Here's a quick sketch of what we'll cover:

ETI January and February 2000: In these issues we will examine the future of artificial intelligence. We predict no shortage of intelligent resources as we know them today. Rather, machine development will concentrate on finding higher forms of intelligent thought, and developing machine creativity (see ETI May 2000).

ETI March and April 2000: Today's fusion energy adequately meets out needs, and will do so for the next decade or two. But will we ever have another Energy Crisis like the one of fifteen years ago? In these issues we will look at possible uses for super energy (anything needing a billion or more times the energy available today). We ask if time travel, super speed spacecraft, etc, will ever be fact? And could we produce super energy if we have a use for it?

ETI May and June 2000: These issues will look at current work in artificial creativity and predict its future. Developments will be dramatic. Machine *'culture'* will develop – creative thoughts from one machine will diffuse to others and they will build upon them. Man will attempt to keep the process under control – allowing separate machine cultures to develop (to keep the cultural range broad) and merging cultures periodically (the most productive creative technique currently known). Machine art will facilitate creating exciting new environments for the stimulation of humanity.

ETI July and August 2000: The reality of Personalised Machine Brains will present a contraversial topic in the second decade. It will be possible, by 2011, to have a personal computer who's only function is to take the strain off your brain. Unlike the personal computers that have been around for the last 25 years, the new PMBs will be permanently linked to your body. Buying educational software will be almost as good as going to college (you will be able to *think* directly in the software's logic), skills can be loaded for as long as you need them, artistic packages will enable you to dance to the limits of your body's ability, recreation packages will provide dream scenarios for your imagination (optionally available for those who don't have any!) to explore, and interfacing to the world's data banks and communications networks will be quicker than blinking!

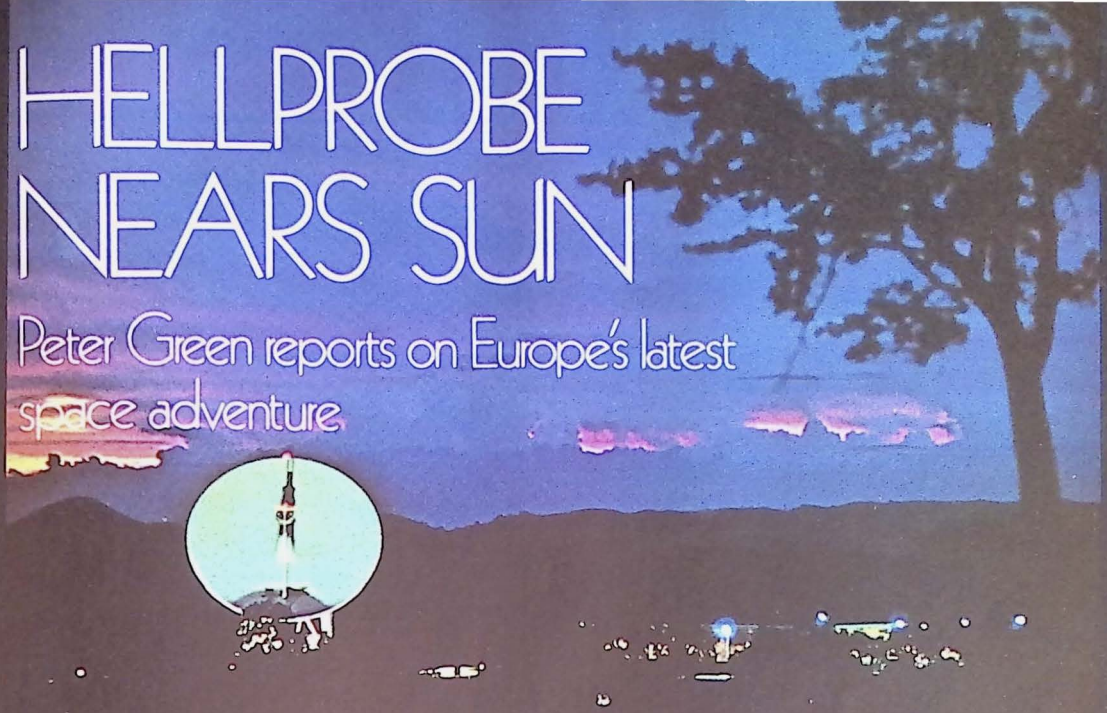
ETI September and October 2000: We predict an end to this decade's dramatic increase in modelling. Things have gone too far when models are accurately predicting far more events than we can sensibly anticipate, and half the world's machines are tied up in collecting data to keep the models running. But it will be fears of machine models increasingly dictating events rather than simply predicting them, (culminating in 2003 when 30M Californians die of starvation after a machine predicts an outbreak of mass anorexia nervosa) that brings in legislation to control modelling.

ETI November and December 2000: By 2006 support will be amassing behind a 'Static Decade' pressure group. This movement will reflect the growing worries throughout society that the social structure cannot keep up with changes in the technological environment. The group asks that the technological snowball be stopped through the second decade, so mankind can reflect the way things are going and put right some of the mistakes. ETI will look at the effect this would have on science and society, and investigate alternatives.

Each of the reports will review the current situation and present interviews with the leading figures. Where applicable we will report on today's research that will dictate tomorrow's technology.

HELLPROBE NEARS SUN

Peter Green reports on Europe's latest space adventure



Scientists are now examining preliminary data received from the revolutionary Hellprobe satellite. Although no results have yet been released to the press, we are informed that maps of the solar surface, at several wavelengths, have been received. In resolution of fine detail they far surpass any records previously obtained from Earth orbit. All at the Emslie centre are now confident that when the Hellprobe enters its close polar orbit about the Sun, the mission objectives will be met and even exceeded.

The HELiographic Lasered-data probe well deserves its nickname of Hellprobe when one considers the conditions in which it must function. The craft must withstand the most extreme heat and radiation levels continuously, whilst maintaining a suitable internal environment to prevent malfunction or destruction of the various electronic instruments and computer equipment. Furthermore this must be done with the lightest possible construction materials due to payload considerations. A polar orbit about the Sun requires the rocket to leave the plane of the ecliptic, that is, the orbital plane of the Earth about the Sun. The much larger power requirements for the rocket impose severe constraints on payload mass and until now the opposing requirements of rugged engineering and lowest possible weight consistent with useful instrumentation were incompatible.

Recent advances in materials science has provided the answer, specifically in the manufacturing processes which require the zero gravity and/or hard vacuum of near-Earth orbit. Much of the internal structure of the craft is fabricated in "metal foam" for strength and lightness, while the outer layer is a ceramic-based compound of such low thermal conductivity that the steep temperature gradient from outer skin to inner electronics is easily attained.

One further innovation in an already unique satellite is the provision of an onboard communications laser, so that data may be transmitted to Earth by modulated light-beam. This system is not subject to radio interference near the Sun which would render normal communications impossible.

The vast effort expended on this scientific venture will be justified if only a fraction of the planners' hopes are realised. Not only will existing knowledge of the Sun's surface and atmosphere be improved manyfold, but the hitherto unexamined polar regions of Earth's primary will be accessible. Locked in its polar orbit, with the Sun rotating beneath it, Hellprobe will be able to scan 100% of the surface area and possibly answer questions about the Sun's structure that have defied scientists for half-a-century.

The Emslie Centre, near Glasgow, where scientists are celebrating the reception of the first solar maps to come back from the Hellprobe.

THE WORLD IN YOUR HAND

Phone anywhere in the world with this walkie-talkie. Dave Sinfield reports.

Further development of the maser receiver has led to the production of the general purpose pocket communicator. The first public demonstration took place in the grounds of the Eurotower on November 24th.

Looking somewhat like the handset of a "trimphone" (very popular in the 70s) the communicator has the usual audio transducers and only one control – a call button. Pressing this causes the communicator to emit the location beam to a nearby Telcom satellite. The communicator then sets up the narrow-beam Maser link: the satellite uses an ingenious but simple triangulation system to pinpoint the communicator's position. The satellite first requests the subscriber's identification code. If the code is valid communication progresses.

Because the communications are on a tight beam there is normally no need for frequency differentiation between channels. Interference would occur when users are within 50 metres of each other. The communicator automatically steps up to a vacant channel (there are 80 channels – fine for most areas, but it is likely more than one satellite will be needed to serve the vertical metrocores of the major cities).

By using the Telcom satellite link all the facilities available to the home Telcom subscriber become available. Telcom's "Talktel" service, recently brought on-line, will enable the communicator to be used for world-wide 'phone' calls.

The communicator also has, as an option, a solid-state audio recorder so that information can be recorded for later playback. The format is compatible with home terminals and by plugging recorded memory modules into these hard copy can be obtained, using the Voxprint service.

But you don't have to have a home terminal to use the communicator. Simple 'phone' operation is available using a unit encoded with your Telcom phone-only number.

European satellite coverage today is only 30% complete, which means you will often have to wait for a channel (if the communicator service takes off at the rate predicted by Cutema).

Telcom UK are making the programs for the PLA, the specialised Maser ACMs have been developed in Holland.

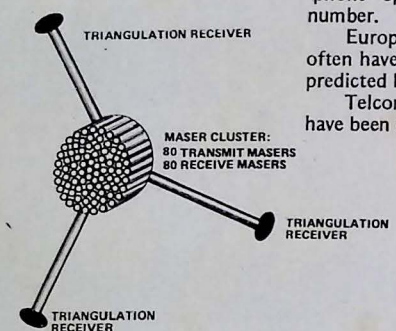
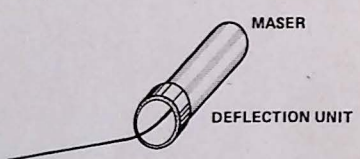


Fig.1.



DEFLECTED BEAM UNDER CONTROL OF PINPOINT SYSTEM

THE TRANSMIT & RECEIVE MASERS ARE VIRTUALLY IDENTICAL EACH MASER IS DEDICATED TO ITS OWN CHANNEL.

Fig.3.

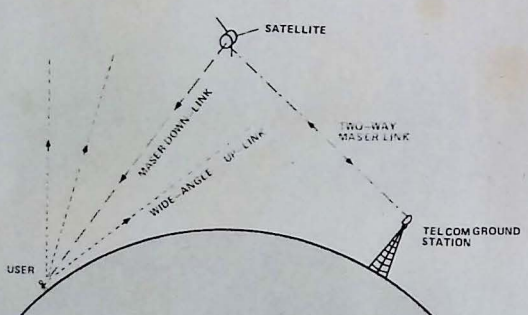
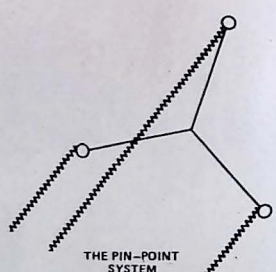


Fig.2.



THE TIME/PHASE DIFFERENCES BETWEEN SIGNALS REACHING THE THREE TRIANGULATION RECEIVERS ENABLE THE LOCATION COMPUTER TO PINPOINT THE COMMUNICATOR

Fig.4.

INDAT 93214729146

Today the communicator costs E700, with a predicted price of E300 in two years. The charge for each satellite link is E1.35 plus E0.01 per second. Other Telcom charges are additional.

The communicator is yet another product of Maser deflection technology. Only a few years ago no-one would have believed that the deflection units being developed for use with transmitting Masers would one day be used as super-selective front-ends on receiving Masers. In the communicator system the receivers are sensitive to an area fifty metres in diameter on the earth's surface. The intensifier effect in the Maser enables the feeble signal from the communicator to be amplified up to useful levels.

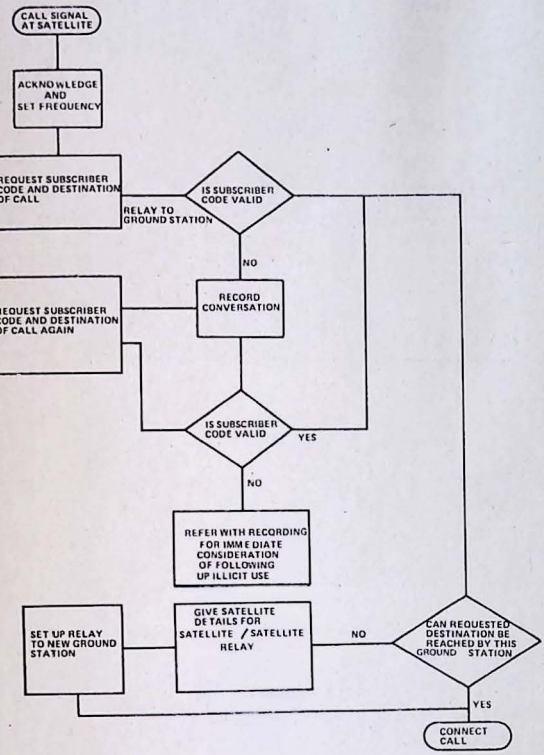


Fig.5.

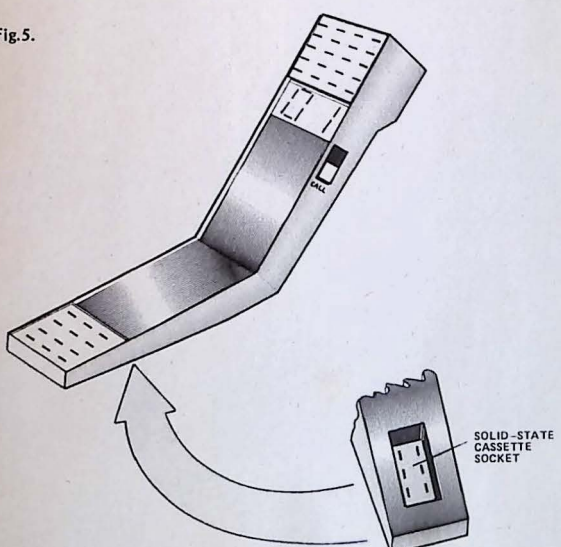


Fig.6.

Fig.1. The Communicator Satellite.
Fig.2. The link from Communicator to Telcom station, via satellite.
Fig.3. The maser beam is electronically aimed using the deflection unit.
Fig.4. The Pin-Point System.
Fig.5. Flow diagram showing operation of the system showing checks against invalid use.
Fig.6. The deluxe handset features solid-state recorder.
Fig.7. Inside each Communicator is an 80-channel microwave transceiver with 60° radiation cone.

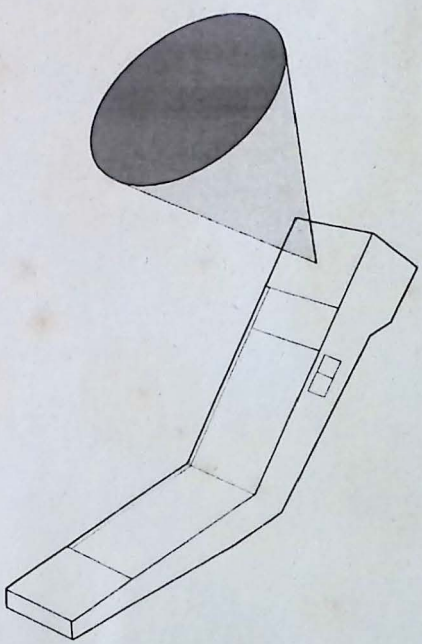


Fig.7.

The Driver-less Car

Ron Harris describes a new aid for the motorist

Three years ago the GLC decision to instal 'auto-location' beacons in conjunction with Motorola UK caused a political storm, costing as it did some E100 M of rate-payers' money. This month came the second storm when the GLC announced a E70M undertaking to equip central London with a 'homing' system based upon these beacons. At a time when less than 1% of 1% of vehicles on the road is equipped to use them this does indeed seem a strange decision. Presumably the council are figuring that during the four years it will take to fit the system manufacturers will produce cars able to benefit from the equipment.

Shining Light

Let us begin by recapping on the locator system itself. This consists of a series of 1272 'beacons' installed at most major road junctions in and around the City of London, which when operated in conjunction with the Motorola Cartell units, can act as the ultimate roadmap.

Cartell projects a local 'A–Z' standard roadmap of the area surrounding the car onto a flat 7197 x 7197 high resolution display screen within the driver's view area, and can plot a course to any given spot – once the number of the nearest beacon to the destination has been input. An optional PROM system will automatically provide this in exchange for a street name, but is somewhat costly at present.

Thus at its most sophisticated you can type in the name of the street/road you wish to get to and the Cartell will pilot you there with alpha-numeric prompts i.e; "second major left", "next right" etc. and a clear map of the square mile around your car with all the beacon positions indicated. The map can be resident within the car system, or can be picked up from a series of plotting beacons around the periphery of the Cartell areas.

To a certain degree you can even choose which route you wish to take by replying to a "VIA?" prompt with a string of beacon numbers. Cartell then plots in a course to get you from A to B taking in the named beacons. Useful for tourists no doubt. If the given numbers constitute a diversion, Cartell puts up "NON–OPTIMUM" on the display just to show it knows better than you.

Re-orientation of the map occurs every time a beacon is passed, such that the display is always facing the same way as the car bonnet. Performing a U-turn does not confuse the system – much as you thought it might – instead you get "ILLEGAL MANOEUVER" all over the display as soon as you pass the same beacon going in the opposite direction! A control is provided to convince Cartell that you are not *really* a criminal and that you have found some way of reversing direction without breaking Government statutes.

Operation

Considering the huge potential of the system, the hardware is really rather simple. No updating has taken place in the three years following installation, because the limits of the present system have not been remotely approached as yet.

Each beacon (apart from the plotting units) continuously transmits an IR signal containing a fourteen bit location code and a two bit error/summation signature. This is decoded by the CPU within the car to produce an orientation and map identification string, which tells the memory which part of London to display, and which way around to put it.

Alpha-numeric prompts are triggered by the error/summation signal corresponding to a given sequence within the memory.

Standard memory size for the basic Cartell is 128M with a further 64M for the location EPROM.

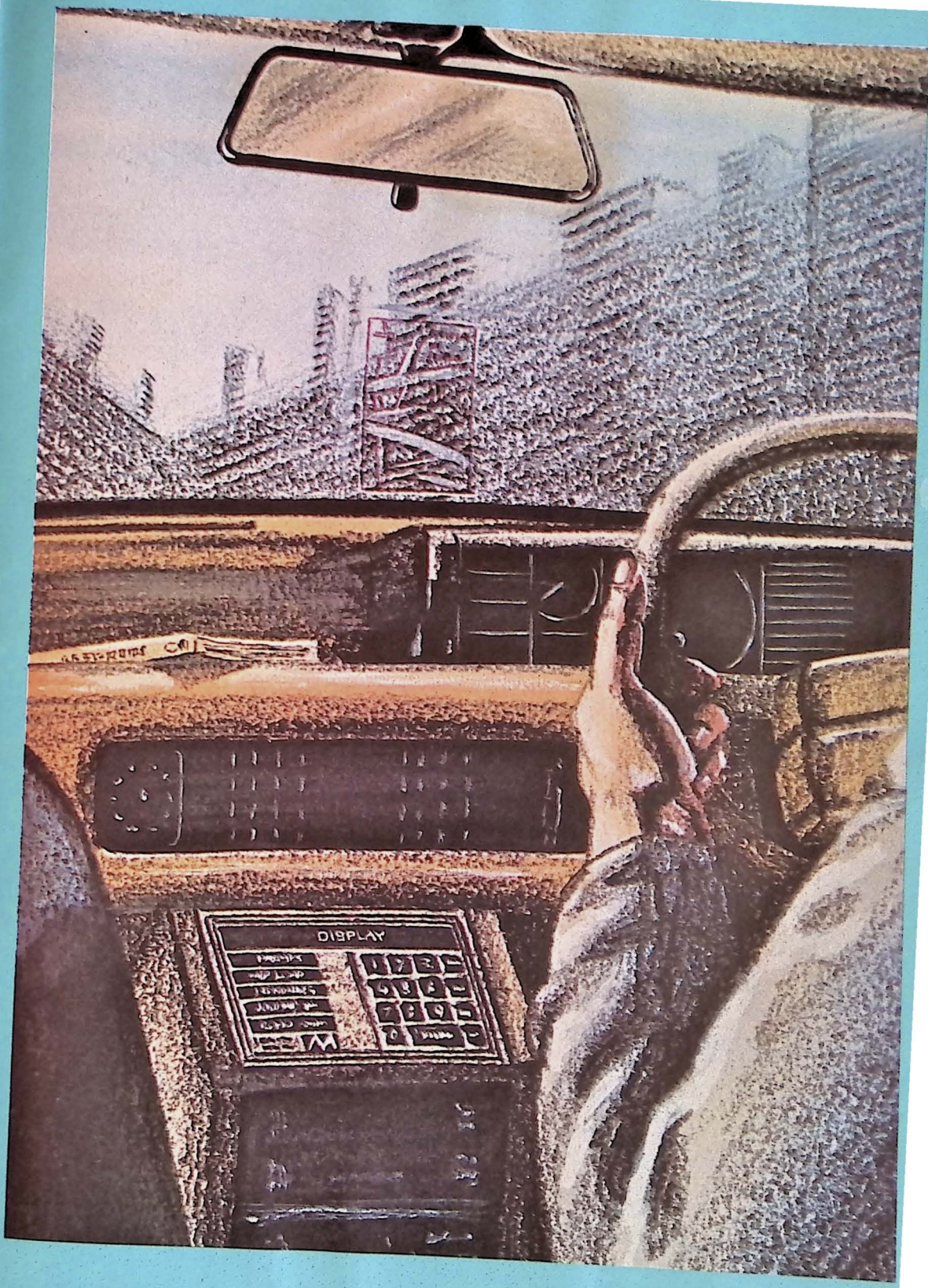
Thus given only a Cartell unit in his car, even a complete stranger to London need never get lost anywhere within the zone covered by the system. Plans to expand the beacon network are underway now, following the success of the pilot (!) scheme. Using a fourteen bit location code the maximum number of beacons is obviously 11111111111111_2 or 16383_{10}, so there is scope for a ten fold expansion at present.

Home James

Plans to make use of the existing network to provide an 'auto-home' facility were announced this month and involve no changes to the actual beacons themselves. Each car intending to run in this manner needs extensive servo-mechanisms fitted, however.

The idea is basically to take control away from the driver completely, and allow the Cartell unit to 'drive' the car using the beacons to obtain its course.

All that is required outside the vehicle is the 'guide wiring' which must run along both sides of the road to carry the signals needed for a continuous steering process. The exact nature of this data is as yet uncertain and this is one of the


DISPLAY

details to be finalised during the pilot scheme. It is possible though that it will be kept compatible with the Cartell data stream used at present and may even utilise some of the redundant bits in the existing 16 bit code.

The vehicle's own collision radar will also have to be standardised to allow for handling a line of cars on one link. Motorola have plans to introduce voice-operated units now that speech recognition is becoming commercially viable due to the (at last!) price dive in bubble memories over the past few years. "Home James" may yet become a reality.

Motorola estimate the capital cost of converting a car to be around £15000 or about half the cost of the car itself! Talks in the USA are going on to convince the manufacturers to offer the mechanisms as an option, which would bring down the cost considerably to the consumer.

It is likely though that a major European luxury vehicle company will be the first to adopt the suggestion, if the London scheme successfully demonstrates the viability of computer controlled driving. It has been suggested too that London Transport immediately equip OATs in this manner as this might constitute a better a better return for the ratepayers' money.

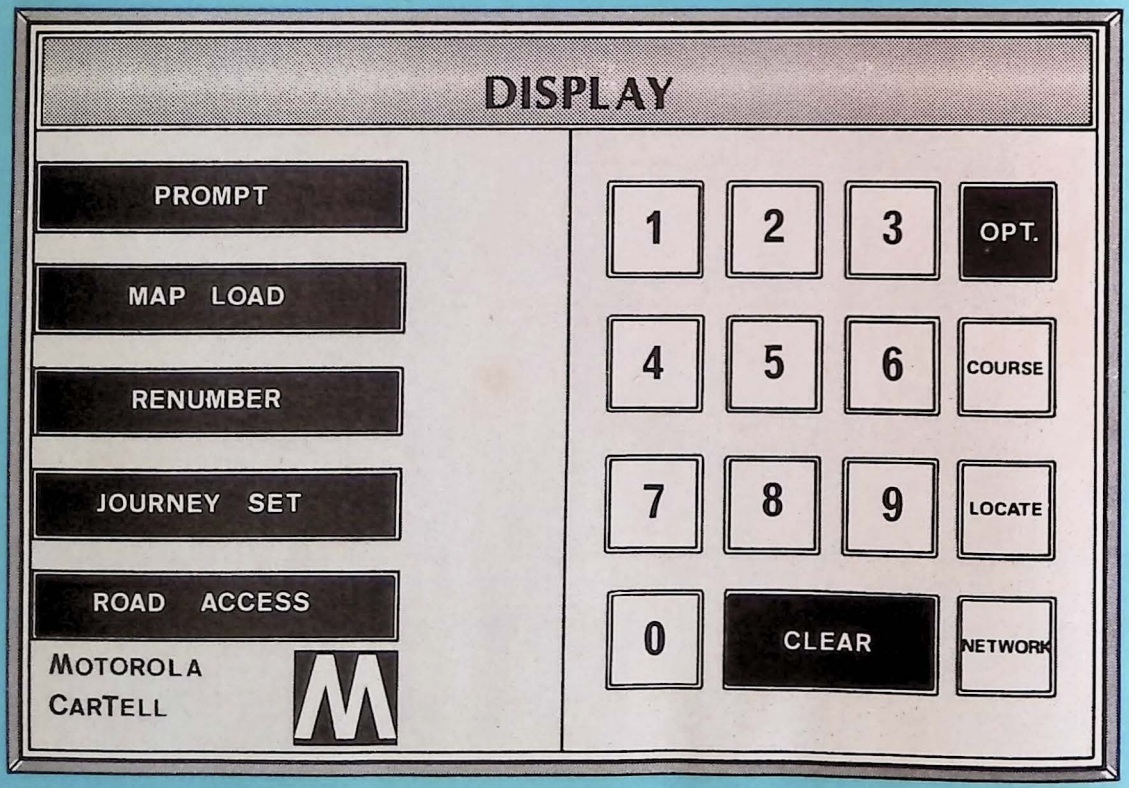
Summary

At present London is one of only six major cities in Europe to be filled with the Cartell mapping network. It is the first to announce a definite intention to attempt the logical extension of this into an 'auto-drive' facility, albeit over a very restricted area.

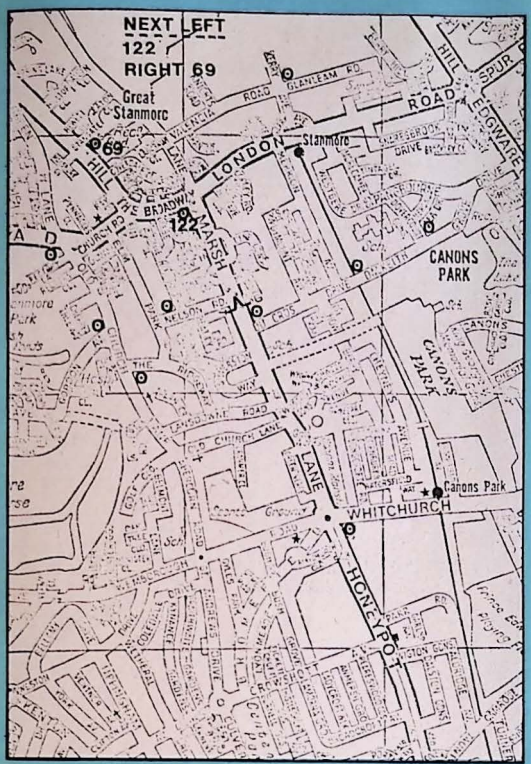
The advantages of the system, as expounded by its advocates, include a drastic reduction in road accidents, automatically enforceable speed limits and possible elimination of drunken driving – or at least an excuse to raise the penalty so high it will become a real deterrent.

Those against say it is an infringement of personal liberty (despite the 'override' switch), a costly White Elephant, a way of getting 'kick-backs' from Motorola or just plain un-workable and doomed to failure.

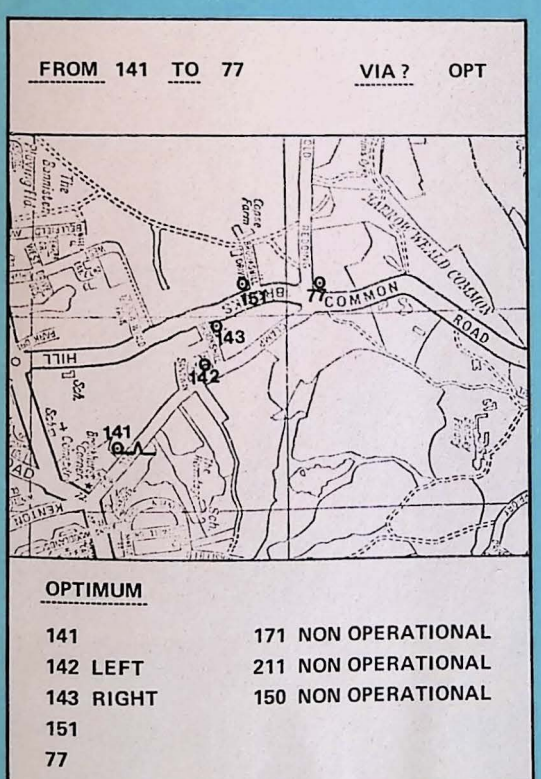
It seems well worth the try to us, and we applaud the enterprise and courage of the GLC for taking the lead in this logical development. It is inevitable that some form of control of town driving – as opposed to the Motorway systems already operating – will eventually be introduced so why should Britain not lead the way for a change?



The CARTELL Console - This standard version responds to inputted beacon numbers. A deluxe version with alphanumeric keyboard and street-name input is also available.



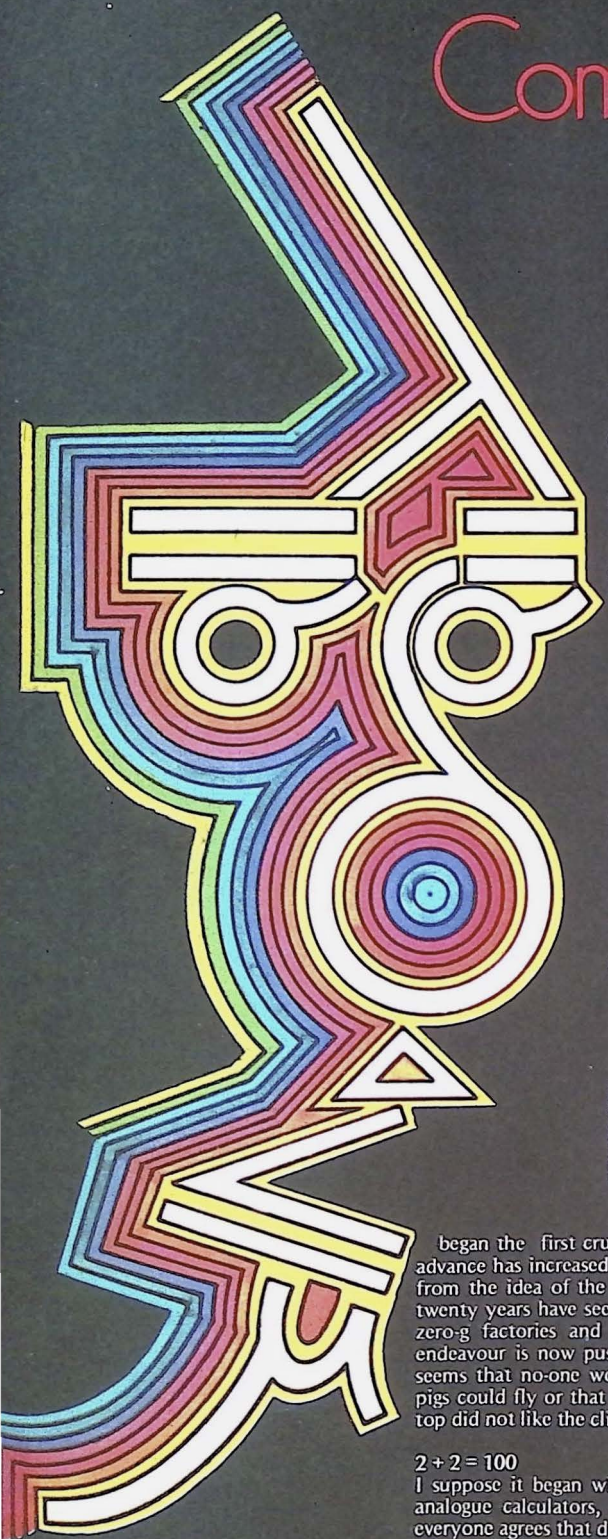
Typical CARTELL heading display. This has been set to 'prompt' mode, and the required destination is a side road just past beacon 69. Note that the only numbers shown on the display are those still to be passed, and that only those units within a half-mile of the car are shown at all.
The vehicle symbol is particularly suitable as it gives heading and position in a clear and unambiguous manner. Note the screen is 'faded' at the top to improve legiability of the prompt text and that destination is kept close to the top.



Complete journey mapping. Here all the route numbers are displayed along with turn directions. The 'Display Expand' is not operable in the 'Setting' mode to allow full use of the graphics. The column at the lower right of the display shows which beacons in the area of the car are 'down' and thus un-usable.

Computers Catch A Cold

John Fitzgerald comments on software viruses, self-replication, and the errors of man and machine



'This attitude (the assumption that machines cannot possess any degree of originality) in my opinion should be rejected entirely . . . It is my thesis that machines can and do transcend some of the limitations of their designers . . . This means that though they are theoretically subject to human criticism, such criticism may be ineffective until a time long after it is relevant.'

Dr. Norbert Weiner.

Long ago, the life that would become Man crawled from the primordial sea. Many millions of years passed until one man; perhaps many, discovered the wheel and began the first cruel turn of the technological revolution. Man's technological advance has increased exponentially; in less than one hundred years we have gone from the idea of the bicycle to the reality of the lunar-buggy. Of course, the last twenty years have seen the commercial development of inter-planetary space with zero-g factories and the increasing popularity of the orbital solarium. Human endeavour is now pushing back the frontiers of science so quickly that it almost seems that no-one would be surprised to see a news-flash on their visi-vues that pigs could fly or that the Earth's orbit was to be changed because someone at the top did not like the climate!

2 + 2 = 100

I suppose it began with the abacus, made a slight detour down the dead end of analogue calculators, and culminated in the design of digital computers. Surely everyone agrees that dynamic digital processing was Man's saviour. Computers alone are now invested with the rank to control world affairs. They have banished famine, eliminated the population problem and though they have not ended war, digital

diplomats are now so powerful that informed human opinion estimates that it will be several hundred thousand years befor ethey run out of excuses for avoiding one. (Uninformed human opinion estimates that by then it will be someone else's problem.)

PIHP

Digital processing could never have reached a position of such pre-eminence without the invention of parallel integrated holographic processors. Although by the nineteen-eighties system capacities had begun to match that of natural systems, it is not just a question of numbers. Most of the 10^{10} neurones in a man's brain, for instance, are linked together into an active data-processing network both serially and in parallel. Computer systems of that period could never begin to approach the richness of interconnection of the natural system.

The breakthrough came with PIHP. You will have seen the layman's simplified explanation of operation on the PPN. People's Popular News, always eager for a sensational story, had a field-day as the industrial giants collapsed with the introduction of the new technology. I still remember the headlines; 'Computer firms get the PIHP', 'PIHP'ed at the post' and the like.

In fact parallel integrated holographic processing was such a simple idea, it is surprising that no-one thought of it sooner. Even back in the sixties we knew how to generate light from semi-conductor junctions and we knew that the process worked in reverse. The first integrated digital processing networks were developed around about that time too. The breakthrough came when Kurt Levinson brought the three units together on a single wafer-thin slice of silicon. One wafer alone does nothing but bring two together and you have the most powerful processing network in the known Universe. (Ed's note. We should remember that as so little is known in the Universe, that may not be saying much!) Anyone who has seen the PIHP Corporation's publicity tapes will never forget the thrill of watching the wafers come alight with a scintillating tracery of myriads of multi-coloured worms of light as the individual gates combine in an electroluminescent symbiosis. The unique advantage of PIHP networks is their resistance to damage. As holographic systems they are able to withstand destruction of up to ninety percent without loss of processing power.

It was inevitable that systems offering such advantages would revolutionise the computing industry unti the previous generation of computers could soon only be found hidden in museums. Initially, it seemed like a perfect technology heralding the dawn of a new millenium. It was a man who first noticed things beginning to go wrong; the PIHP computers were careful not to notice their mistakes, indeed they were only following orders!

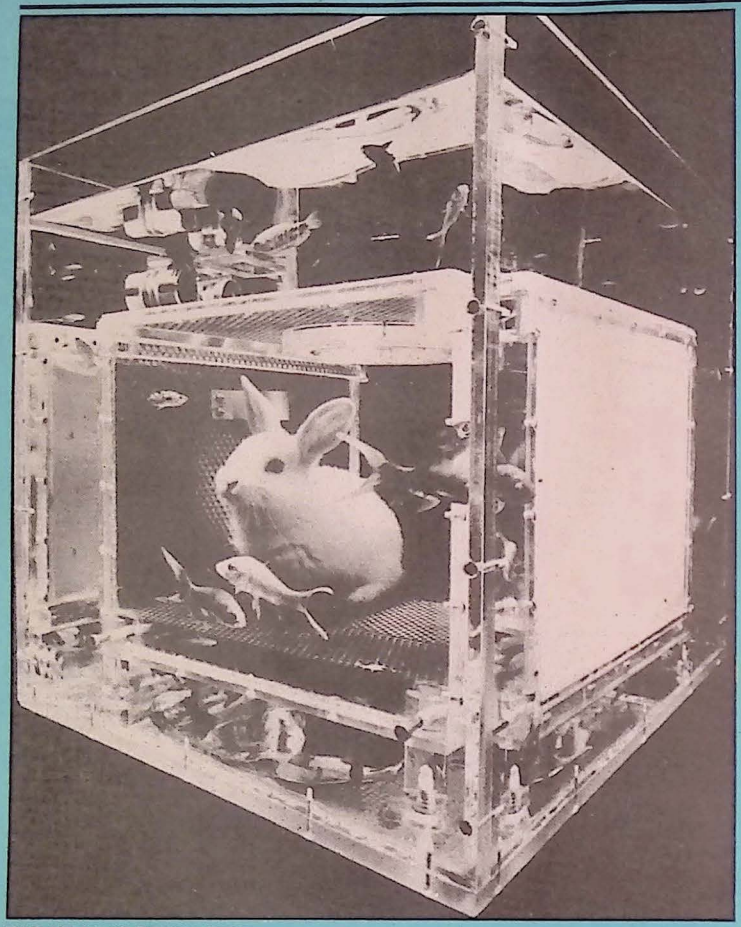
PDR

Self-replication is the art of nature. Only recently have artificially viable systems been detected and identified. Transmittable diseases in logic processing were postulated in a paper by Schmitt which received considerable professional disapproval and no popular attention whatsoever. It was Hutt's demonstration of proto-digital reproduction utilising an array of PIHP wafers that convinced the sceptics.

He had demonstrated an apparently perfectly working system to the utter boredom of the onlookers. They had seen all this before and PIHP was considered so reliable that no-one bothered with the routine diagnostics anymore. Then he produced another PIHP wafer; apparently identical to the rest and added it to the array. The result was a blinding flash of light and then only a small globule of glass remained; burning a hole into the plastic surface of the bench top.

As his audience sat in stunned astonishment, Hutt calmly explained what had occurred . . . The PIHP array had harboured a virulent bug; a piece of three-dimensional code that had colonised the array, draining power and blocking growth of the processing network. The built in redundancy of the arrays had served to disguise the problem and Hutt suggested that the bug and others like it had probably infected other systems across the globe and possibly had spread into space. Why then had the addition of one more wafer had such a catastrophic result? It was simple. Hutt had programmed the wafer in advance to resist the bug and the array had overloaded while trying to overcome the killer code. PPN broke the story. You could not turn on a visi-vue without seeing some reference to it; 'The new magic bullet', 'PIHPs squeak with battling bugs', 'Hutt's syndrome attacks PIHP arrays'.

Scientists are now directing a concerted world effort to discover non-destructive ways of testing the PIHP arrays . . . their tool? The old unreliable electronic computers, salvaged from museum basements. Perhaps we shall soon have to revert to the abacus. Maybe we should never have crawled from the sea!



FIRST UNDERWATER CHANNEL SWIM

Last week, Nicola Watts, a 12-year-old from Wolverhampton, became the first person to swim the channel underwater, thanks to the General Electric artificial gill she was wearing.

Soon to be available commercially, the 'A-Gill' straps to the swimmers' back, like a scuba, and can sustain breathing underwater for indefinite periods. The company has been working on the device for over 20 years (see photo of rabbit hutch submerged in fish tank – this dates back to the 70s!). Expected market price of the A-Gill is E8000.

BRASILIA'S NEW TAXIS

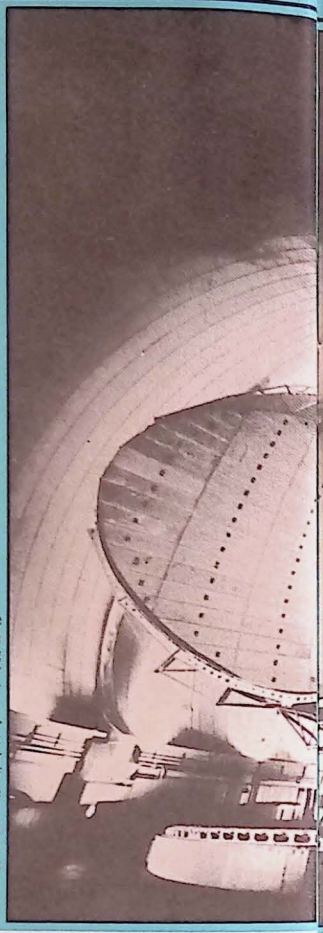
Modular, driverless, taxis powered by mobile fusion reactors are now serving the metro area of Brasilia. Half the cost of setting up the service has been provided by Tokafus Inc, who are anxious to win acceptance for their mobile reactors. In the Brasilia taxis Tokafus engines circulate a high-temperature plasma (composed of deuterium and tritium atoms) through a doughnut-shaped reactor. At the moment Tokafus have to take the reactors back to their service centre once a month to rejuvenate the magnets and exchange cannisters.

The computerised navigation system used in Metro Brasilia was implemented by Nipsoft, and is virtually a copy of their system in Tokyo.

LASER GUNS NOW E150!

Nigeria's mass-production of laser pistols has brought down their price to E150 in Africa. On the black market in Europe they sell for five times this price. European authorities are worried by the proliferation of these weapons in the Third World, and the numbers (an estimated 2M in 1998) being smuggled into the Continent. Fortunately illegal imports of feed and pump cartridges have been successfully controlled thanks to Supersniffers at major ports.

The latest in underground laser weapons is the pen laser – as popularised in the 'Return Of The Avengers' series on TV. The 'disposable' pen laser uses the same techniques as the laser pistol (a 3 micron chemical laser fuelled by hydrogen and iodine compounds).



The Little Big Horn tracking station near Andover which is to be demolished next spring after 15 years of service. The station has been unused since the last Pigeon Satellite went down last year.

GLADIATOR ROBOT CONTEST

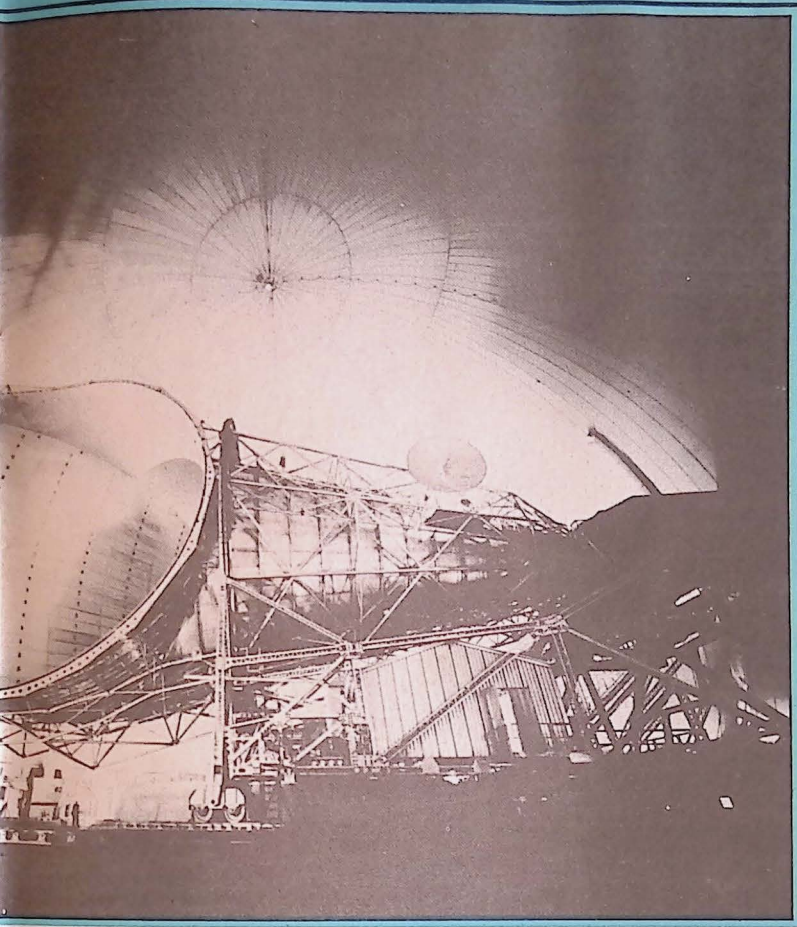
This Christmas' Gladiator Robot Contest will be held on Boxing Day at the Wandsworth Astrobowl. New for 1999 is the 'Mammoth' section for robots at least 100 m^2 and over 40 tonnes. Modmags is sponsoring one of the robots, Hebot 4600, which was designed and built by the ETI/HE/CT workshop. Another Modmags entry is in the flying robot section. The events will be televised live on channel 24.

CUTEMA HOMEWORK REPORT

Published this month is Cutema's report on Homework. The agency says that in Grade A sectors Homework now is more common than Travelwork. And Grade A is growing – in the British Region, for example, 10% of the population live in Grade A designated areas, compared with only 2% at the beginning of the decade (corresponding to 20% and 15% by land area).

Cutema predicts that by 2010 half of the population will work from home and live in Grade A areas.

NEWS



ELECTRONIC BRAIN FOR DOG

Scientists in Wisconsin have wired-in a portable electronic brain to the body of an English Sheepdog. The brain controls the main muscles needed to keep the body alive, and the dog, Pepe, will walk under the control of ultrasonic pulses from a remote control unit. Pepe has to be fed by hand, but digestion is automatic. Sensory inputs are limited to connecting up the ears and the nerves from the tactile sensors on the limbs.

Previous artificial-brain experiments have needed large back-up with men and machines to keep the animal 'alive'. In this case, a single human master with simple equipment has been able to keep Pepe alive for over a month.

Novel features of the Pepe experiment are conductive plastic artificial nerves, and the integration into a single unit of standard micro-electronic implants for basic functions.

The experiment was nearly stopped by a Supreme Court order instigated by the Animal Lovers of America organisation and the Church Alliance, but supporters of the research – mainly from national bodies representing people who benefit from electronic brain implants to cure diabetes, speech disorders, epilepsy, etc – won their case. There is no doubt that spin-off from electronic brain research will help in controlling human illness, the unanswered questions are the ethical ones.

NEW COMMUNICATIONS SYSTEM FOR FREIGHT SUBS

Plessey have won the combat to fit communications equipment to Interfreight's new fleet of unmanned nuclear freight submarines. The contraversial submarines will start their work in 2003.

REAL-IMAGE HIFI FOR DOMESTIC MARKET

Philips in Eindhoven forecast the end of virtual-image hifi in the next few years. The cost of acousto-electronic lenses will fall from E10000 to E1000 by 2001, they claim.

KITCHEN SINC

Rumours are getting hotter and hotter that Sinclair International are about to introduce a kitchen robot. Although we first carried news of this nearly a decade ago (ETI, Jan 1991) with updates about every year since, no-one outside SI has seen anything yet.

With production of IPRs (Industrial Production Robots) running at over 1,500,000 a year from the three European makers and imports from Indonesia, Brazil and Mexico accounting for another 800,000, the cost of the robot has fallen to about E12000. At these prices the upper income groups may well be interested.

IPRs, of course, have revolutionised production lines, but only the latest models are genuinely mobile. Learning still requires several weeks alongside a human operator every time a new task has to be undertaken. However, with recent breakthroughs in software (see ETI June 1998), from Strathern Software, it appears more and more feasible that a mobile robot with the capacity for domestic work could fall into the right price level.

DRs (Domestic Robots) will handle all food preparation, cooking and cleaning up afterwards. The only inputs needed will be menus and return of the dirty dishes.

Our sister magazine, "Robotics Today", carries a major feature this month on DRs.

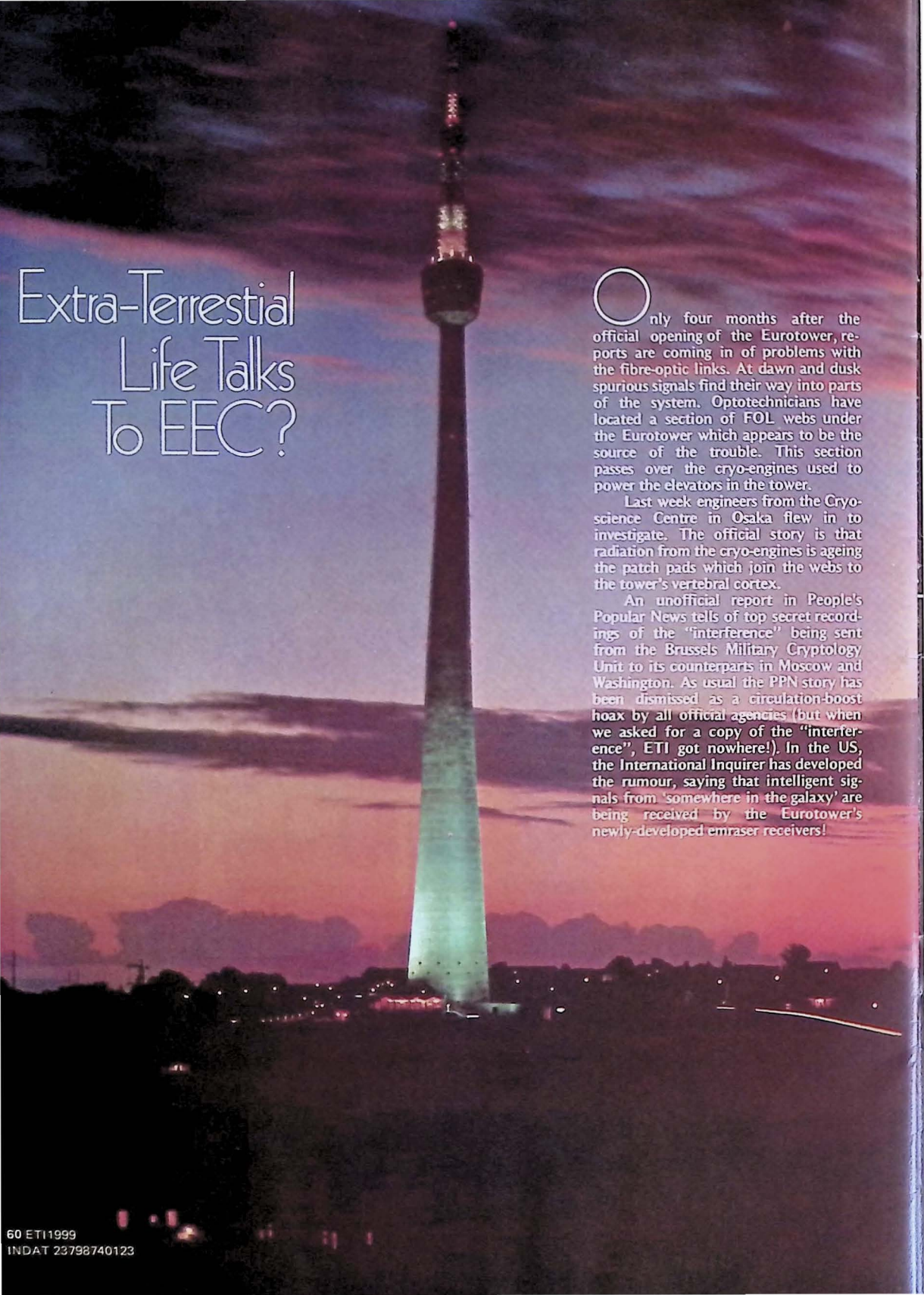
NEW RECORD CLEANER

A new accessory for the audiophile is the Bib D27 record cleaner. This product is available from 01-282-7124 for E40. It uses 4M of memory. Correlation tests show 99.998% accuracy in recovering audio from a signal with 1% random corruption, compared to 99.6% correlation for records cleaned-up, from 1% dirty, using ultrasonic cleaners. Using both digital and mechanical clean-up, 100% correlation can be assured for all but the most badly damaged discs.

NOW 10,000 SMALL REACTORS IN BRITISH REGION

The EAEA Distributed Energy Sourcing Program this month hit its target of 10,000 local power stations in Britain. Fifty percent of the prefabricated stations came from factories in Japan; and half the remainder were from the Czech-fusion plant in Prague. In the period of granting the 10,000 licences, the EAEA says it has withdrawn only 27, and boasts never having declared anything more than a yellow alert in the Region.

Extra-Terrestial Life Talks To EEC?



Only four months after the official opening of the Eurotower, reports are coming in of problems with the fibre-optic links. At dawn and dusk spurious signals find their way into parts of the system. Optotechnicians have located a section of FOL webs under the Eurotower which appears to be the source of the trouble. This section passes over the cryo-engines used to power the elevators in the tower.

Last week engineers from the Cryo-science Centre in Osaka flew in to investigate. The official story is that radiation from the cryo-engines is ageing the patch pads which join the webs to the tower's vertebral cortex.

An unofficial report in People's Popular News tells of top secret recordings of the "interference" being sent from the Brussels Military Cryptology Unit to its counterparts in Moscow and Washington. As usual the PPN story has been dismissed as a circulation-boost hoax by all official agencies (but when we asked for a copy of the "interference", ETI got nowhere!). In the US, the International Inquirer has developed the rumour, saying that intelligent signals from 'somewhere in the galaxy' are being received by the Eurotower's newly-developed emraser receivers!

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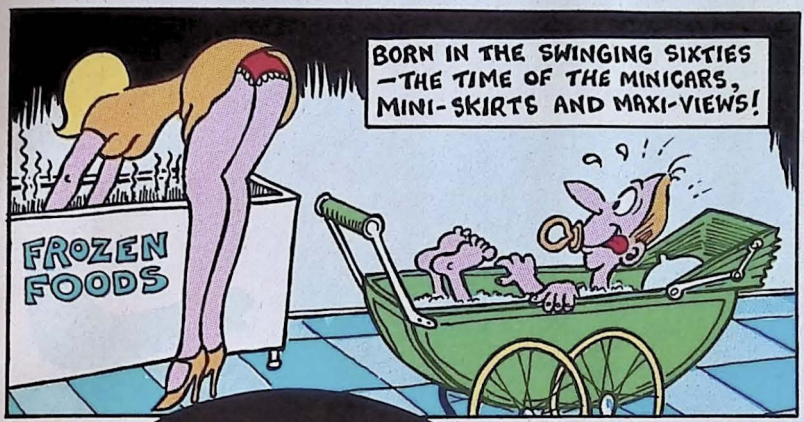
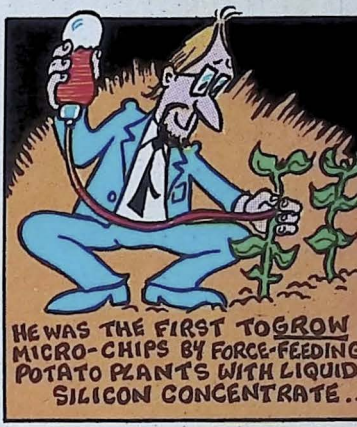
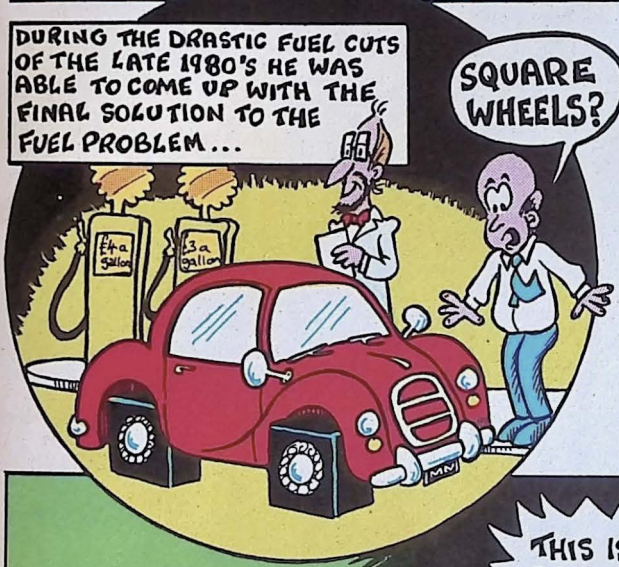
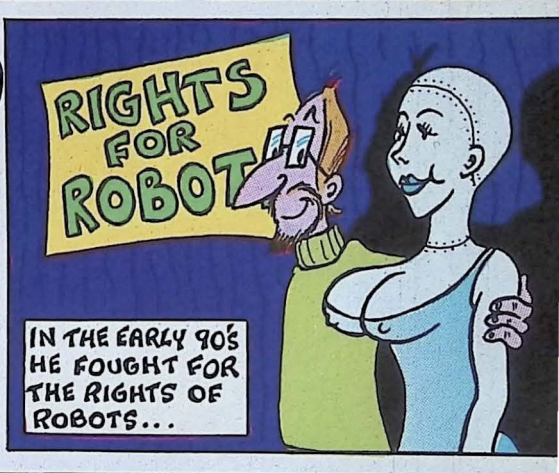
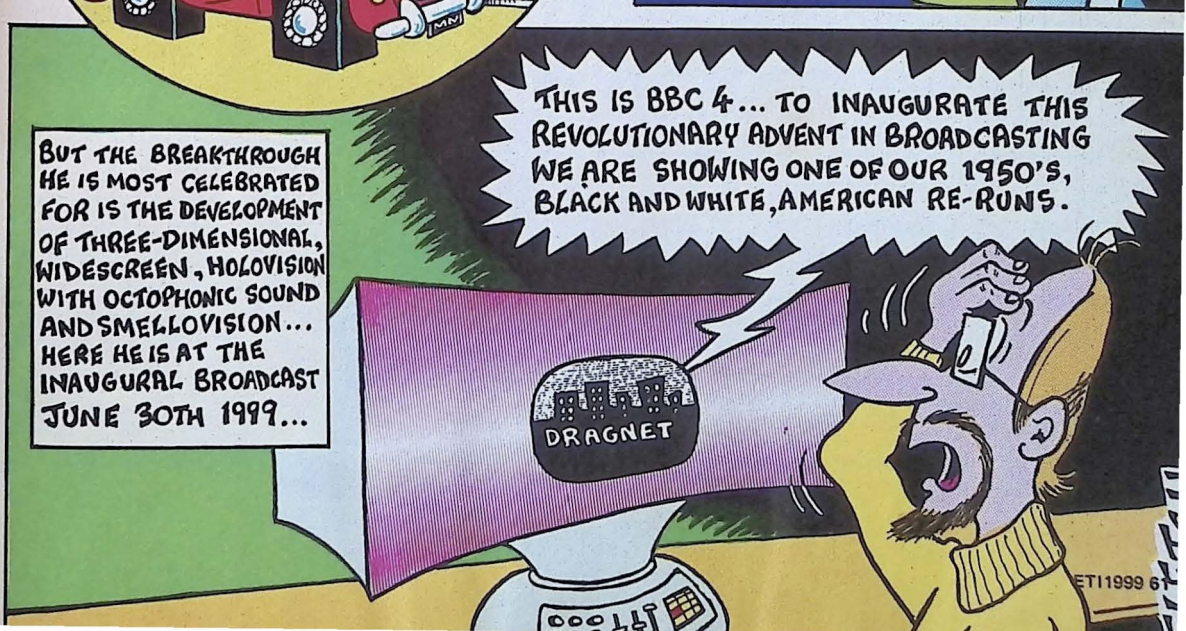
INVENTORS OF OUR TIMES











Credits

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4,5,6,7	Words: Steve Braidwood.* Photographs: Barnaby's Picture Library, Cartoons: Fletch.
8,9,10,11	Illustrations: Dee Camilleri.
12,13,14,15	Model by Keith Brindley. Photography: Gabby Karminsky, taken at Pieff Contract, Store St, London. Photo Montage: Diego Rincon. Technical Drawings: Paul Edwards, Dee Camilleri.
16,17	Illustration: Diego Rincon.
18,19,20,21	Illustrations: Diego Rincon.
22,23	Photographs: Novosti Press Agency.
24,25	Illustrations: Diego Rincon.
26,27	Photographs: McDonnell-Douglas; UPI.
28,29	Illustration: Paul Edwards.
30,31	Photographs: Technalogics; Pye. Drawing: 'Viewdata & TV User' Magazine.
Centre Spread	Words: Ron Harris. Illustration: Diego Rincon.
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48	Words: Steve Braidwood. Photograph: Barnaby's Picture Library.
49	Photograph: Barnaby's Picture Library.
50,51	Technical Drawings: Paul Edwards.
52,53	Illustration: Jack Horner.
54,55	Technical Drawings: Paul Edwards, Dee Camilleri.
56,57	Illustration: Diego Rincon.
58,59	Words: Steve Braidwood.* Photographs: Barnaby's Picture Library.
60	Words: Steve Braidwood. Photograph: Barnaby's Picture Library.
61	Fletch.
64	Words & Illustration: Ian Graham.

* News items New Texas Typewriter, Discover Music By Terminal & Kitchen Sinc were contributed by Ian Graham, Steve Ramsahadeo and Halvor Moorshead.

Editor: Steve Braidwood.

Art Director: Diego Rincon

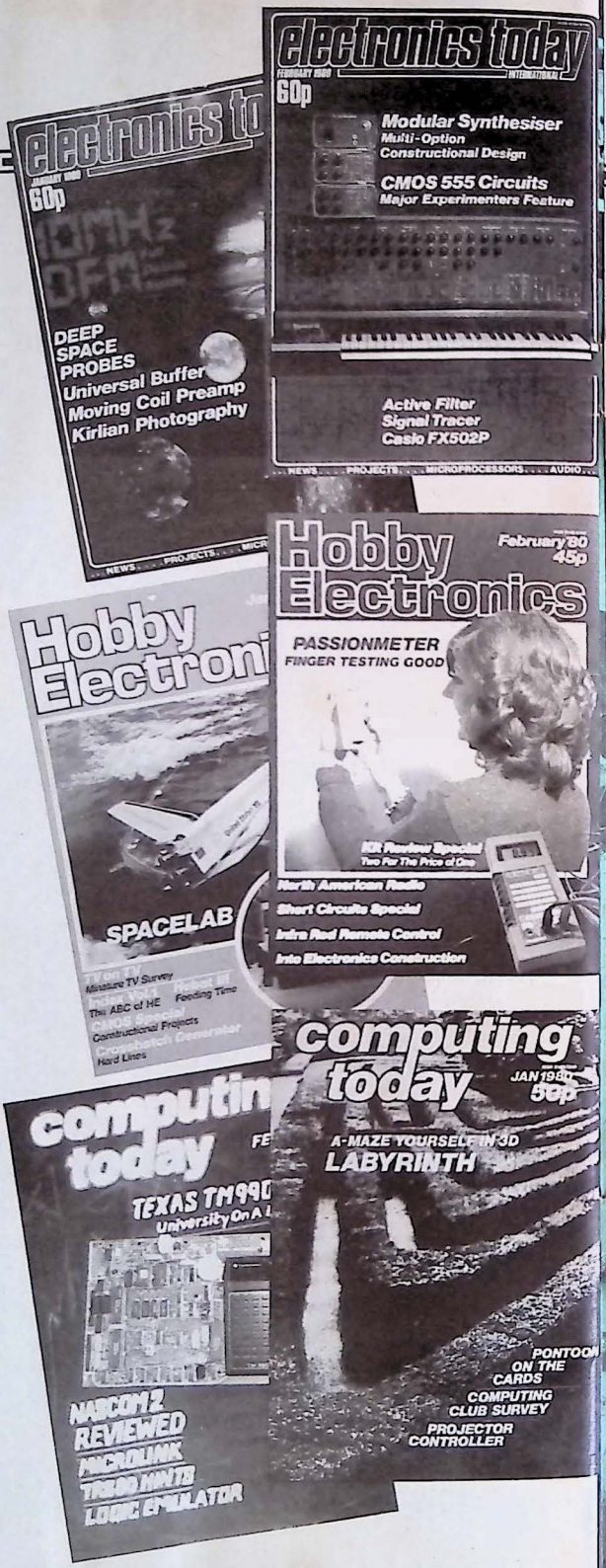
Production: Dee Camilleri and Loraine Radmore.

Printing: Folder: LSG, Lincoln.
Magazine: Worcestershire Web Offset, Droitwich.

Distribution: Argus Distribution, London.

Colour Separations: Colourfax, Sutton.

Published by Modmags Ltd,
145 Charing Cross Road,
London WC2H 0EE.



Monthly Magazines (in 1980) from the same team:

How this magazine came to be

"What will ETI be like in 20 years?" I remember asking everyone at Modmags that question back in the autumn of 1979. This magazine incorporates many of the answers I received. All the articles are written by the staff of our magazines (ETI, HE and CT) and our "Specials" department. Although fiction, the writing is based on today's science fact. Actually there's very little in ETI 1999 that isn't technologically possible in 1980.

It was great fun to write for ETI 1999 : it must have been even more fun to illustrate it. After hard days on our mentalities, Diego and Dee spent many an evening preparing illustrations for this "Special", and working late with Loraine on the overall production. Thanks. . . .

The editorial content is reasonably different from that of ETI 1980. One reason for this is that we think electronics, as we know it, will not exist in 1999. Black-box PLAs (programmable logic arrays) and ACMs (addressable control modules) will be hooked-up with optic fibres and programmed to do most of the jobs done by today's magazine projects.

Another reason is that in 1999 ETI will be (we think) a "personalised" magazine compiled by computer to satisfy the interests of the individual subscriber. The "H.W.Moorshead" that this magazine is compiled for is our Managing Director, who is leaving the company about the time this magazine is published. Halvor edited ETI for most of its life and ETI 1999 was originally his idea.

If you enjoyed ETI 1999 and would like to read more about electronics today, try one of our monthly magazines (described on the left) or one of our "Specials" (advertised on the right-hand side of page 47).

S.B.

ELECTRONICS TODAY keeps you up-to-date with the latest in technology and developments, with examples of implementation in our popular projects section. It is a life-line of ideas for the hardware-oriented enthusiast.

HOBBY ELECTRONICS is our magazine for amateur project-builders and gadget freaks. HE tells you how to make the most out of living in the technological age.

COMPUTING TODAY is written by people who get their kicks from home computers. We talk about what is currently affordable and available, what you can build for yourself, and how to have fun!

Magazines for enthusiasts, from enthusiasts.

ETI 1999 is an Electronics Today International Special published by Modmags in Spring 1980.

WIN A TRIP TO SKYLAB

Six simple questions and a bit of imagination stand between you and a trip to Skylab 10 on the space shuttle Galileo.

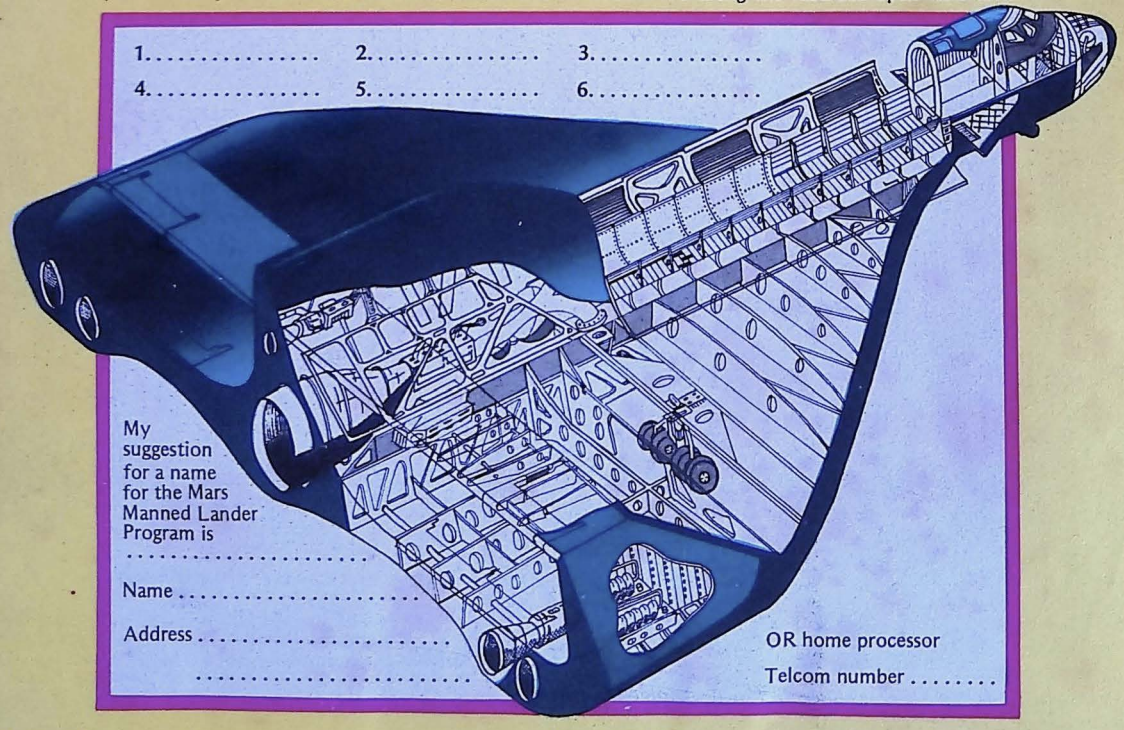
1. Who is known as the father of rocketry in the West?
2. What was the first operational surface-to-orbit Earth Shuttle called?
3. Who was the first man to live in Earth orbit for more than one year?
4. What expensive piece of space junk was salvaged in 1998 and now stands in the middle of the Moonbase Mare-1 complex?
5. Who was the first British scientist to work on the Moon?
6. How many days did Nomad-3's crew spend orbiting Mars?

In the event of a tie, we have an interesting decider – NASA (the North Atlantic Space Agency) is short of a name for the Mars Manned Lander Program. If you can answer the six questions above and suggest the most appropriate name for the MMLP, NASA will fly you to the Johnson Spaceflight Centre, from where you will be whisked into Earth orbit by the shuttle Galileo. Onboard Skylab 10 you'll be able to enter another competition to win a trip back to Earth!

You can send your entry on the reply coupon provided or key your answers into your home processor and send them off to Telcom 395411178 along the fabulous optic land line.

1..... 2..... 3.....

4..... 5..... 6.....



My suggestion for a name for the Mars Manned Lander Program is .....

Name .....

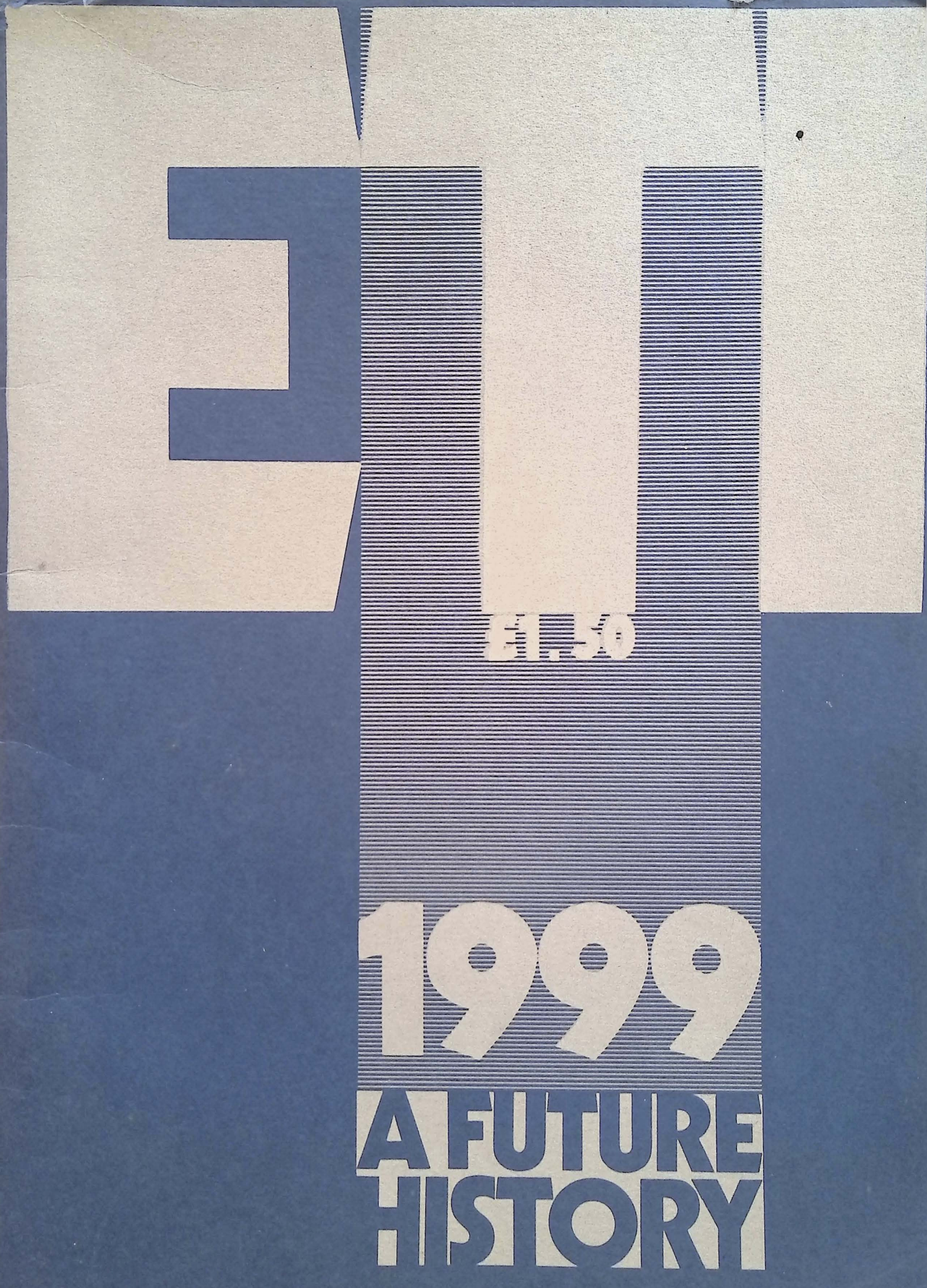
Address .....

.....

OR home processor

Telcom number .....

ETI9912. SUBSCRIBER: H.W. MOORSHEAD, 3759215.


1999
A FUTURE HISTORY

This Is What ETI Magazine Will Be Like In 1999!

CRAMMED WITH COLOUR

THIS FOLDER CONTAINS A VERY SPECIAL MAGAZINE.

A MAGAZINE FROM ANOTHER WORLD

A world of robots, instant information, moon-mining and manufacturing in space. It is a magazine from beyond World War Three, when electronic brains are programmed to replace the kind of circuits we know today.

It is a magazine from the year 1999, a personalised magazine compiled by a computer to match the 'interest profile' of the individual subscriber.

It was written, illustrated, produced and published by the staff of Electronics Today International, Computing Today and Hobby Electronics.

£1.50