**Ivor Catt**
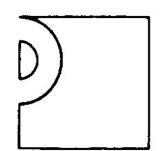
# COMPUTER WORSHIP

what the manufacturer's maintenance contract involves. Establish the mean call-out time and also the mean time to repair a fault. Investigate alternative maintenance agreements with the manufacturer. Determine whether the manufacturer provides a twenty-four hour fault reporting and call out. Demand an equipment life-expectancy list.

7. *Insurance.* Ensure that you understand when insurance liability passes from the manufacturer to you.

8. *Documentation.* Establish whether additional charges for adequate documentation to suit your needs will be incurred.

9. *The order.* Check with the sales engineer that your order is correct in every detail, otherwise you will not receive what you expected.

So much for buying your computer. When you have struggled through all of this, your troubles are only beginning.


**The Glitch**

"It's not the computer that goes wrong, it's the people who operate or program it. The errors are human errors." This lie is repeated so often that it is difficult to counter. In a strange, illogical way, it is reinforced rather than weakened by the opposing comment "No machine is perfect. Every machine is bound to break down occasionally." The feeling prevails.that computers are highly reliable, far more reliable than any other element in society, and that in particular the computer is more competent than its users. "If only we could get rid of the human element", it is said, "all would be well."

Most people have experience of one or two computers breaking down, giving them a wrong bank statement or shopping account. However, they feel that other computers are surely better than the one or two they have experienced, and in any case they have been

assured that the fault resulted from a human error by a since-departed employee.

But what about the computer breakdowns that no one can explain? There is theoretical evidence, published a number of years ago, that a computer will periodically go wild. This evidence is ignored in the computer industry, because those few who have come across the theory find it wiser in the short term to ignore it. I myself was ordered not to publish anything on the subject "because it might upset our customers". Who will buy a computer if it is acknowledged that it will periodically go wild?

All drivers have experienced that panicky feeling when the traffic lights change from green to amber at an unfortunate moment, and it is difficult to decide whether to jam on the brakes or to go full speed ahead. If the lights had changed a little earlier, the decision to stop would have been easy; a little later, and the decision to continue would have been easy. Once in a while, a computer faces this sort of indecision when deciding what do do next, and very occasionally, say once in a thousand million times, it is unable to decide either way for a long time — too long in fact — and a disaster occurs in the sequencing from which the computer cannot recover. The computer has a nervous breakdown. This is similar to the driver taking too long at the traffic lights over his decision, and being hit by another car. I like to call it the "glitch".*

Designers nearly always dismiss such an event as very unlikely, but since a computer does a million operations per second, that is, about a hundred thousand million ($10^{11}$) in a day, such an unlikely event, occurring once every $10^{10}$ times, will happen every two hours.

A friend of mine is in charge of a £500,000 computer system which goes mad about once every eight hours and spoils the information in its memory, which then takes four hours to restore. He has had the computer for two

*For a bibliography on the glitch, see T.J. Chaney and C.E. Molnar, "Anomalous Behaviour of Synchronizer and Arbiter Circuits", *IEEE Transactions on Electronic Computers,* April 1973. The subject still has not risen above the correspondence columns in that august journal.

years and is by now very sad. Like most other computer users he has not heard of the problem of the glitch, and doesn't understand that the trouble is with his machine. (Dr D. J. Wheeler of the University of Cambridge Computer Laboratory has found that at least fifty per cent of the computers whose design he has studied in detail have faults of this kind.)

I was concerned about the problem of the glitch as early as 1959, and finally published a paper on it — the only one published until recently — in 1966. It attracted no attention until 1972, when the repeated breakdown of computers around the world caused a convention to be organized by Dr C.E. Molnar at the Computer Systems Laboratory, Washington University, St. Louis, Missouri, to discuss the glitch. Leaders of the computer industry attended, many under compulsion, and it became clear that nearly all of them were unfamiliar with the problem. We can be sure that computers controlling the launching of nuclear missiles have the glitch problem, which means that at some random point in the future one of them will break into confusion and the third world war will be upon us. The fascinating thing is that no one will be to blame. We are talking here about a fundamental short-coming in the design of computers around the world, and the unfortunate designer of the computer which accidentally launches the third world war will be no more at fault than the rest of us, who have failed to control the mindless monster which is modern science.*

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*Fortunately, perhaps, the computers of 1973 or 1984 which are unable to reason carefully over the launching of world war three are unlikely to be any more efficient in its implementation. For myself, I should be more convinced about the credibility of the nuclear deterrent if a scaled-down demonstration were given. The President could stand on the front steps of the White House while an unarmed, scaled-down version of an inter-continental ballistic missile was launched from the other side of the Potomac. He could watch it land neatly in the centre of his front lawn, while journalists, Russian diplomats and other observers watched from a safe distance. This might lend some credibility to the claim that unmanned missiles can hit Moscow from a thousand miles away.