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Informal Minutes of a Meeting held at the Atlas Laboratory on Thursday 29th December 1966 between I.C.T. and the Atlas Lab. to discuss the performance of the core store

Present: Dr. J. Howlett, Mr. J. E. Hailstone, Mr. M. H. J. Baylis, Mr. R. Short, Mr. J. Ainsworth, Mr. K. Lonsdale, Mr. P. D. Hall, Mr. G. Haley, Mr. P. Dean — Atlas Lab. / I.C.T.

Dr. Howlett made the following points, with Jim Hailstone:

1. The core store is still not reliable enough.
2. It takes far too much maintenance to the detriment of the rest of the machine.
3. There are one or more stack pairs locked out for most of the time instead of just occasionally.
4. There are always new faults being found and promises, later unrealised, that this at last is the source of all the trouble.

Peter Hall remarked that he was not familiar with the detailed pattern of the core store faults, the responsibility rested with E.S.O. (which is Engineering Support Organisation.) However, it was an old design of store and new stores have far less electronics so expect to have better reliability. At the decision time, which was a long time ago, the Plessey design was good although their engineering standards were low; we are now of course suffering from it.

Jack Howlett remarked that we had paid £600,000 for the store and expected rather better of it, he pointed out that if the machine was counted as being down when a stack pair was out the reliability figure would drop to below 60%.

Gordon Haley mentioned the dry joint trouble, after some discussion about the deterioration as shown on Peter Dean's maintenance charts. Keith Lonsdale then explained that the thick resistor leads on the Plessey packages had not been bent over underneath which had given them a bad solder connection because the solder wasn't hot enough; this gradually crystallises out. He thought that this type of joint could be eliminated altogether and believed that this would solve the trouble.

There was some discussion by John Ainsworth and Red Short about finding these dry joints, it was pointed out that many had been found in the factory before it came out.

Jack Howlett then re-emphasised his point 4, that new faults were always being found etc. Peter Hall agreed that the stores were in a bad state and asked what could be done. Peter Dean remarked that over 50% of the engineering time was taken up in the maintenance and repair of the core store. Peter Hall suggested one ought to concentrate on one stack pair for a couple of weeks, on mending the dry joints and seeing how successful this was in getting rid of the faults. Keith Lonsdale in support of this said that if there existed no fundamental design trouble then dry joints must explain everything, and that must be the view of E.S.O. Peter Hall re-emphasised this.

Mike Baylis thought that the store should be scrapped and a new one put in. There was some discussion about how this could be managed. Mike Baylis remarked that Plessey's 2½D store had a design specification of one fault per 1500 operational hours and Peter Hall thought that the 2½D store might be the one to have. The first of these is promised in May 1967 and in fact is going on the TITAN at Cambridge. He also mentioned the delivery of Plessey's other up to date store the RAB/3 was about 9 months. Keith Lonsdale intends to visit Plessey's about de-dry jointing the store. About 1,000 components per stack would need to be replaced, John Ainsworth calculated. Component replacement would be necessary to avoid a re-occurrence of the trouble. Peter Hall thought this would take 9 months or 6 at the best.

Peter Dean said that apart from the dry joint trouble simply replacing 1,000 components per stack would cause a lot of trouble. The stack would almost need re-commissioning afterwards.

Peter Hall said there were the following alternatives:

1. Let Plessey's carry on re-soldering these joints.
2. To replace the 1,000 components per stack, which he thought was the one to do.
3. John Ainsworth interposed and said that stack 9 had been re-soldered a fortnight ago and had not failed since; he refused to take a £10 bet from Mike Baylis that it wouldn't fail this week.
3. ~~Peter Hall said~~ One could replace the whole store.

Keith Lonsdale said that mere re-soldering would give more than six months breathing space.

In reply to a question from Jim Hailstone he explained that a solder joint with solder made not hot enough will fail anything from one to five years after and until then the joint looks perfectly O.K.

Jack Howlett said that replacing so many components scared him and he dreaded the effect it would have.

There was a discussion about making new packages but this would take 3-4 months. John Ainsworth and Peter Dean said that there were five types of packages to be looked at; for example, the 963 board, has 16 resistors to be changed and there were 50 such packages per stack.

Mike Baylis again stated that he thought the store ought to be replaced In that case, Keith Lonsdale said, resoldering would be enough to tide the system over until a new store came. Peter Hall fought very shy again.

Peter Dean said he could do one stack pair re-soldering per weekend. That is, six weekends to do the whole store. He thought all packages would have to be looked at. Keith Lonsdale then suggested a float of 50 extra 963 packages to help out. Discussion then centred on the prospect of replacing the store. Gordon Haley described the Plessey 2½D store. 16K of 48 bits plus two parities only occupies a space of 19" x 16" x 21". It has only two component types and a much reduced component count. He thought that technically this would be the one to go for rather than the RAB/3.

Peter Hall raised the point about who would pay for the store. SRC would be getting a much better store than they were entitled to, how should the cost be borne between SRC, Plessey and ICT? He offered to work out in detail how it might be done and how much it would cost.

Gordon Haley thought it would take two weeks with the machine down to modify the core store co-ordinator, then 16K stacks could be inserted and commissioned in turn, perhaps with a further two weeks down time altogether. Peter Hall thought if an equitable arrangement could be made he would be delighted to see it done.

Peter Hall, summing up, said ICT will embark on the re-soldering exercise then make a proposition about replacing the store. As a time scale we have twelve weeks re-soldering, and a prospective order might be placed with Plessey's for 64K of 2½D store in February or March 1967 for delivery in October or November. If the present store settled down to an acceptable level then the order might be cancelled, say any time up to August, without any cost to anyone. This would allow 3-4 months to see whether the core store ~~would~~ was settling down. Those present thought this was an acceptable statement. Gordon Haley finally suggested an interim measure in the installation of 64K might be to have 32K

new store and use the best 32 of the old 48K dynamically. In fact this might be a sensible point to stick and perhaps to decide later whether to get another 32K of new store.

M. H. J. Baylis

24.1.67