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<td>Interviewee’s forename:</td>
<td>Raymond</td>
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<td>Occupation:</td>
<td>Electrical engineer, RAF signals officer, computer designer.</td>
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<td>Mother’s occupation:</td>
<td>National Savings Bank clerk, volunteer nurse.</td>
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<td>Date and place of birth:</td>
<td>25 July 1923 Addiscombe, Surrey, England</td>
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<td>Father’s occupation:</td>
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And … right, I think we are good to go –

Right, my – I was born of lower middle class parents, my father was a … a quantity surveyor, my mother had been one of the very first women employers in the National Savings Bank where there’d been men until then and so this was just about at the beginning of the war. Anyway I was brought up at – mostly in Croydon and then moved to Caterham, village near Caterham when I was about four or five. After going to ordinary council school I won a scholarship to a public school called Caterham School in 1934 and stayed there till 1941. I was extremely lucky in that it was an *annus mirabilis*, the class I was in were – had four very high quality lads above me, which gave me a great spur and that was absolutely grand. At Caterham School I joined the RAF … equivalent to the Cadet Corp and during – when the war came along … I wanted to go to university but I couldn’t earn a scholarship ‘cause there weren’t enough of them, but then they needed trained men for the forces in electronics because of – not only was radio expanding but radar was coming along so they offered degree courses to selected people who then could get a commission in the forces as technical officers, which is what I did in the RAF. Went to Woolwich Polytechnic where I spent two years, the building had been bombed to hell during the blitz but had been – had recovered and gave me a good – very good education. The four universities in London … set their own degrees so I got a – an internal degree at London University in electronic – electrical engineering. After that, into the RAF as a signals officer, service in UK for eighteen months and then out to India for another eighteen months, when I came home to the UK and … went to Imperial College to – do you want the humorous bit about – or not?

*laughs* Yeah, certainly just –

No, no, it depends what type of interview you want, do you want dry as dust with –

*I think I’d like it in all its glorious social history around it if possible, at some –*
Right, okay, it can be done. So I won what’s called Mid Tour Leave when I was in the RAF and came home after eighteen months in India, because the war was just over, VE Day – VJ Day had happened and when I got to England I decided to go to Imperial College and say, ‘I’d like after the war to take a PhD,’ and they said, ‘Yeah, no trouble at all, come in, let’s have a talk,’ so we had a talk and they said, ‘Yes, okay,’ and so I said, ‘Well I – I don’t know when I’m going to be demobbed,’ and they said, ‘Oh no need for that, we’ll get you out of the RAF,’ so – and they duly did so I didn’t go back into the RAF and went to take what I thought was going to be a PhD at Imperial. The first thing they said was, ‘Oh yes, well you’ve been away from education for some time, I think you better do the last degree year again as revision,’ didn’t like it but did it and then they said, a man called Willis Jackson incidentally said, ‘Oh yeah, well, we’re now making PhDs three years not two,’ and I said, ‘I can’t possibly spend three years after also wasting a year doing this introductory course,’ so I took a one year MSc on the absorption of ultrasonic waves in ascetic acid, of which there is a thesis in the library if you’re really interested. But the real thing I had was building and modifying kit to transmit pulses through liquids, very much like radar.

[04:24]

So having left Imperial I then got a job with GEC Research Laboratories. They were at Wembley, a lovely research laboratories they were, but after two years a man called Womersley who started the ACE Development computer development at Teddington at –

*The NPL?*

NPL, yeah, he – he got my name and rang me up and said, ‘Do you want a job doing research in counting by – with – with valves?’ and I thought, that sounds a good idea so I did and so I went to what was then BTM, or Hollerith, at Letchworth starting to develop what were computers. Hollerith had decided – who used to be – have a manufacturing agreement with IBM, but had ceased to have it two years beforehand, decided they’d got to develop the computers to … stop … migration of their best customers away to manufacturers of computers, to be used mostly for commercial purposes … so I went to Letchworth where conditions were primitive because they
hadn’t expected me and the – the electronic engineers that were already there
developing multipliers and calculators, a bloke called Billy Woodshill and his team,
gave me a little bit of space at the end of a bench where I tried to exist and the next six
months were spent with Womersley, taking me round the computer industry to see
what people had done and he had – he was very well connected, he knew many many
people, so I went to NPL, I went to Cambridge, I went to Manchester, I – I went to the
service establishments on the south coast of England and at Malvern, which was a
government – and we bought a magnetic drum from one of them and that sort of
thing. Then BTM found Doc Booth or Doc Booth found BTM. Dr Booth had been
developing small computers at Birkbeck College and he needed input and output from
these machines, so he persuaded that in return for the knowledge of what his
computers consisted of, BTM would give him free tabulating equipment to join onto
his computers, which is a jolly good deal. So a team of us in the very cold winter of –
of a year which I’ll have to work out, went to copy Booth machine in an old barn at a
place called Fenny Compton, which is just north of Banbury, in a terribly cold winter
with slippery roads and that sort of thing. The barn was falling to bits and Booth was
building most of this with his own hands. And so we went in and copied this and took
the – the drawings back again to Letchworth where we first of all bought – built a
machine as is, we didn’t mess about with the electronics, so in other words the
machine we were building was not fit for production, it was a typical university thing
where all the components, and they were individual components, no printed circuits of
course, were just piled in – into the machine and it was – nothing was replaceable and
for the servicing of computers you do need items to be replaced, you don’t want to
have to change every resistor or capacitor. That – that I was … intrigued and …
overawed is too strong a word, taken by the ingenuity and thought that Booth had put
into this machine, his … economy was remarkable; unlike most academic developers,
Booth was well understood that the cost had got to be kept down, principally ‘cause
he hadn’t got much money from Birkbeck, so the machine was about as small as you
could possibly make it, the minimum items that you must have in a computer, like,
you know, control, shifting registers, store, input, output, arithmetic units and so forth,
were all of the minimum size that you could and the final machine ended up with
about 500 valves in which is – is really very remarkable. So having got – got that
back to … Letchworth, then proceeded to build a model of it and design how to attach
tabulators to it. Tabulators come in many sorts of individual machines, each of which
do particular purposes like – like punchers, verifiers, tabulators, input punches, printers and so forth, so we had to have a choice; do we put a tabulator on it or do we put a punch on it and the first one we decided to put a tabulator on it because you could see the output and it was demonstrable. Luckily Hollerith was well used to adapting their tabulators for all sorts of purposes and had very high quality, local chaps who had learnt the hard way as to how to design and modify their machines for all sorts of purposes. So I was … given one of these chaps who was absolutely excellent and between us we designed the machine to go with the computer. One interesting point that is worth mentioning is that because computers work for unknown amounts of time on each little piece of calculation, they are asynchronous as far as the external world is concerned, whereas tabulators are synchronous, you start them and they go chug-chug-chug-chug as each card goes down, so the – the first thing we had to find was an asynchronous tabulator, luckily one had been developed called an E6-6 which we had and so that would start immediately you called it, you didn’t have to wait for it to come round to its zero point. So an E6-6 was put on and it worked. Then we took it up to London to demonstrate at the Business Efficiency Exhibition, the year of which I shall have to work out again. The Business Efficiency Exhibition is the place – the showplace, the annual showplace for the punch card industry together with calculators, copiers, typewriters, all that sort of thing and this – this machine got up there and we installed it and … we couldn’t demonstrate it yet on a true commercial programme because, A) it hadn’t been programmed and B) the store was too small, and we’ll come to the store again in a minute. The – so we had it playing noughts and crosses and I built a noughts and crosses input output machine and did the programming for noughts and crosses that worked well. Then a chap called Ronnie Michaelson who was the – the sales side of the computer business and he was an actuary and a very clever man too, he played it – programmed it to bid a hand of Acol at Bridge, Acol is one of the – not programme – what is it called, where you have a system, Bridge players have a system which they work between partners and Acol is one of these systems, so he … the visitor was asked from a pack of cards, each of which was pre-punched punch cards to select a hand, which he would and we’d stuff it in a machine, chug-chug-chug-chug, and up the printer would go, almost immediately saying, ‘I bid two clubs,’ or whatever it happened to be. So that was a good way of demonstrating it. Very well received the machine was at the exhibition, but of course everybody said, ‘When the hell are you going to be able to do something
for business?’ so the next thing was that back at base – well we knew this already, we had to evolve the machine, A) to make it fit for production and B) to make it do commercial programming.

[13:14]

Better say a word about Hollerith, Hollerith had a vast number of customers, almost every firm of any size, all the government departments, the services, utilities, everybody had a punch card installation of some sort, not necessarily Hollerith, they might have been Power Samas which was our – they were two American companies who had setup in this – in this country, but IBM was not in the UK at that time because the UK was defended against IBM by pounds, shilling and pence, because commercial programming immediately means payroll and immediately means stock control, both of which needs pounds, shillings and pence, which luckily a computer can handle very easily. You have to convert the input from Stirling into binary and then – oh I forgot to mention the machine is a binary machine, to binary and then the output has to be converted again to Stirling if you want to print it to make the print bars print at that – this is done by a software in the machine. Stop for a minute.

[14:37]

Covered quite a lot of time very quickly there, do you want to use that as a sort of summary point perhaps and we’ll go back and explore some of the things that have come up?

I would suggest that you take this away, look at it and put little things in, more please, more please, that’s irrelevant, or whatever you want to – effectively edit it not from the content – well the content point of view to what you’re trying to get – do you want to – be very happy for that to happen.

Okay.

Right. Let’s just think of a little bit more. Where have we got to? We’ve got the first HEC demonstration machine produced, so the next thing to do was to engineer the
machine so that the components were on removable pluggable units, so that they’re easy to service. The first machine was wired up solid, there were no plugs and sockets in it, except in the odd places, so – but a commercial machine must have the – the computer broken down into units and in our case the company already had a – a plug-in unit which held about ten valves where you could replicate, have wired up by ladies in rows with the wiring done by looms where the wiring loom is already pre-prepared and soldered onto the thing. Booth’s basic circuitry was excellent, it was reasonably well tolerated and usually worked, but there were various areas where I had to spend a long time sanitising them, particular things called function trees where you’re decoding say five binary digits into thirty-two lines so that you – whatever number you put in, this one line is stimulated. Booth had done this with resistors, high tolerance resistors, but the balance between the line you wanted to select and the lines you didn’t want to select were – was too marginal so these had to be redesigned with … rectifiers which may give you a far better swing on the thing you’re trying to select.

[17:09]

During all this time I kept on having ideas and I have three books full of ideas, each of these were little tiny steps, why don’t we, couldn’t we and so forth, almost all of them fell by the wayside but – because we didn’t need them or didn’t want them, but the crucial decisions are in – in there, almost all these are sanitising things to make the thing more reliable, some of them are to give them other functions that Booth hadn’t designed and so forth. So, having produced one prototype which was shoved together, not fit for mass production, we then produced a second prototype which was producible and that went to the next year’s Business Efficiency Exhibition, well received and we marketed that because the store wasn’t large enough for commercial work, and I’ll come to sizes later, best thing to market that was for various scientific and engineering establishments, so we made a batch of seven of those, they were called HEC2M, M for marketable and they went to such places as Boscombe Down, aircraft establishment, ESSO Fawley Refinery, two electronic research establishments – sorry, aeronautical research establishments north of Bedford, ARE I think one of them was, I can’t remember the names. One to GEC Research Laboratories, and more about that later. And strangely enough one to the … Indian Mathematical Bureau at
Calcutta I think and this machine disappeared off to there and we never heard a word about it because in fact it disappeared over the Himalayas to Russia, so [laughs] they – they liked one of everything, so whether it did Russia any good I have no idea.

[19:30]

So that was that, so having produced those – what were called scientific machines, I started the very hard work then on making a truly commercial machine which could do payroll, invoicing and so forth. The drum was increased in size, we had a divider on it, it could take a punch so you could punch out information for feeding back into the machine next week, and a printer so you could print out payrolls or what have you on it, so you had to have both of those, you could say, well why don’t you print out – punch out the results and take them away and put them through a printer, no reason why you shouldn’t but it’s yet another operation, so it’s much better to have it all on one machine, especially as if you have the printer attached to the machine, then information straight from the input card can be fed straight across to the printer without going through the computer at all. Making full use of all the many excellent features that a tabulator can – has already built into it. So HEC4 was designed, built, tested and sold and it sold over a 100 machines, I think 120, which … was equal to all the other computers built in Great Britain at that time. However of course, not in cost, it didn’t – if you summed up the amounts that some of the other machines cost then it would far outweigh that, a thing I’m very proud of, keeping the cost down. Stop for a moment, yeah. Is this the sort of thing you want to hear?

Yeah, yeah, this is great, I’m – I think at the start of the first interview I think it always helps if the interviewee sort of summarises their career as they see it, from that point we can sort of pick up again –

You can manipulate. Right, so … we have now … got to the stage where the fully commercial electronic computers are being developed and shipped by ICO [interviewee meant to say ICT] out and the need for software was becoming apparent. The first machines, the programme – sorry, the customer programmed his own machine, people like really – hadn’t got around to things like operating systems, but all sorts of subroutines which are necessary for the use of the machine under the
circumstances were being developed, various conversion routines and so forth. But of course the store was still 4,000 words maximum, of ten decimal digits per word, forty bits. It was only when mag tape and other bigger stores came along that you could consider really large hunks of software. But the commercial people of course had to provide routines for payroll and stock control in particular, which are the two main jobs that a commercial machine finds itself doing. The machine didn’t need an air conditioned room, it could work … delete that, delete that, that’s a – not true, sometimes it did, sometimes it didn’t. These machines – because Hollerith had installations all over the world, particularly in ex-British colonies and – and dominions, the machines went all over the world and I think the first HEC4 went to Tasmania of all places … when you produce computers in any quantity of course the servicing is a vital point, and here were new machines, entirely unknown to the great mass of Hollerith servicemen, Hollerith had huge teams of services, men servicing the tabulators and – and punches and collators all over the world and very good chaps they were too, but they weren’t electronically trained so there was firstly a – a gang of serviceman had to be hired straightaway to get these machines working and they were hired from all sorts of things, particularly ex-servicemen and … radio hands to – to keep the machines working. Then the training schools got going on training our own staff to – to keep the machines going, so the service side was gradually built up.

Hmmm.

[24:37]

Soon after that the … General Electric Company, who had taken delivery of one of our machines, a chap called John Wensley in GEC Research Laboratories Wembley had – said, ‘We must have a computer at Wembley research laboratories,’ so one of them went to him and to them and GEC decided they’d got to get into the computer business because GEC’s motto was, ‘Everything electrical,’ and without a computer they weren’t everything electrical, and they found this to their cost because there was a contract for a research establishment for Pyestock, the gas turbine development area of the government and they had lost this contract because they hadn’t got a computer so they had to have a computer somewhere in their – their quiver. So they approached BTM and it was decided to setup a separate company called CDL, Computer
Developments Limited, half from GEC and half from BTM and I was elected, ordered, to join this company and GEC put in some first class chaps on their side, we didn’t put in, apart from me says hevery good people, and CDL had its own premises in – in Kenton near Wembley, run by a man called Dr Espley who was a GEC man who had made his name in microwave links up the country, from London north to Birmingham and Manchester. He was a – an organiser and he decide – he said, ‘I – I act as fighter coverer for my chaps,’ he wasn’t clever technically at all but he managed to get things done and set up, but he didn’t really fit in either with GEC or BTM in – in the – in the big world and he gradually faded out, and a man called Peter Ellis, who became very famous in ICT, ICL, took over from him. The first thing – we didn’t know what we were going to do but we weren’t the sort of people that worried about that, we settled down to find what we were going to do. So we produced a number of projects, each with a little report, P1, P2, and even – they came to nothing, but the one that did ring a bell was P4 where we’d suggested a new transistorised computer and transistors have got an awful lot to be said for them if they worked because they meant no heaters and very much less power supply to be done, and also of course the transistor could be assembled into the electronics itself and didn’t have to have a special plug in base and that sort of thing. So a transistorised machine it was, and the logical basis for that … having experience of the HEC4 from me, was that it – we called it the – the hoover machine because it beats as it sweeps as it cleans; translated this means that the machine must be able for commercial purposes to be able to take input at the same time as it’s calculating, as the same time as its outputting. It must not be stifled waiting for one of these to finish before the next thing does. So for instance it might be reading in and at the same time doing a conversion of the numbers, doing some arithmetic and streaming the output to the output device for the previous calculation while it’s still taking in this calculation, and unlike the scientific field where the rate of – of calculation is vital for doing large things like matrixes and other matrix – other mathematical operations, the speed of computing is that not vital in a commercial machine, what is vital is the throughput, the speed of input and output and getting the information off the punch card in our cases and out to the printer, that’s what is the crucial feeling in the machine, this allowed us to use what’s called a PRF, Pulse Repetition Frequency, far below that that was used for the scientific machines like ACE or the Manchester machines and the –
we used forty kilocycles which is – is quite a low PRF that that could be translated into one millisecond for one word transfer time …

So this is an individual operation then, taking one millisecond?

Yes, an addition or subtraction would take one millisecond. However, the machine is – was – relied on a magnetic drum, not for its storage, but also for its timing, and a magnetic drum has words spread out round a track on the drum, so unless the word you want next is coming off the drum next you have to wait for it to come, and this involved a process called Optimum Programming, which meant that having worked out the programme that you wanted the machine to do, and what numbers to go onto the drum and off the drum, and the drum stored, not only the word, the numbers, but also the instructions, so it was a dual purpose store for the instructions, which is a key of bits that controls the – the arithmetic operations you’re going to do and the numbers themselves. So for instance, if the machine could select the next word from the previous word and we’ll come to – it can’t necessarily do that if you’ve got track switching going on, but that’s another point, assuming that the next number coming off the drum is available immediately, then yes an operation would take one millisecond, one millisecond to read the instruction off, another millisecond to do the addition of what you wanted to do and say another millisecond to put the number back onto the drum, would be a typical series of – of instructions. Stop for a minute [both laugh].

[31:22]

And this is awfully bitty, this is very fragmented.

Would it help if I put more structure on this, because –

Oh yes, it would indeed.

Okay, well shall we take what’s been said so far then as part summary for me to go away with or cover a much longer period than I think we’ll get through today otherwise –
Yes.

And I’ll sort of take you back with a few more detailed questions from –

Yes, delighted, yeah.

Yeah, hmm –

Because the other thing is, obviously dates, characters, timescales, prices, don’t come immediately to – to my mind, I would have to look them up.

Okay, okay. Right, so that’s basically summarised, what, thirty years of your career I expect.

Yeah.

So let’s go right back to the start.

Right, okay.

And I don’t think you mentioned where you were born?

I was born … at Addiscombe which is Croydon, a suburb of Croydon where my parents had a … a terraced house, with a garden at the back, and it was right next to Addiscombe Park so I had a place to play and there was a little school, a nice – very well run small kindergarten which I – I went to and – but soon after I became at the kindergarten my parents bought a house right out in the country, at a village called Chaldon Caterham Surrey, right up on the North Downs which was a mile from Caterham and to my astonishment, coming back to think about it, I still stayed at this school in … Ashburton which is a – a suburb or Croydon which is probably ten miles away from my home, or fifteen, and my father used to take me when he went to work, but I would come all the way back on three different buses and a mile walk from my little school at Croydon at – to my home in – in Chaldon which it was astounding
looking back … what’s the word, my parents were very … not just supportive, they – they were happy for me to take risks looking back on it.

Was it a good school?

Which one, the –

The one you stayed at?

In Croydon?

Hmmm.

Croydon was yes. But then it – they threw me out of that because I was – we weren’t paying rates to Croydon that we – we were out in Surrey so we were not – you know, the – why should he have free information here when – so I then changed school to another one which was nearer home at Purley which was probably ten miles away from home, that only implied two buses rather than three, nice little – Purley Church of England School it was called, good education there, yeah?

What was the change like between the two schools, what was the difference between them?

I can’t honestly remember, I didn’t really feel any … sense of loss or difficulty of coping. No … didn’t sort of have that sort of problem. In fact most of life I’ve sort of sailed through things somehow without any problem … adaptable I suppose the word.

Hmmm.

Right. So you’ve got me now –

Back in school. What were your favourite subjects?
… Well undoubtedly the science subjects, such as – well they weren’t really science at that time of my education, but mathematics and … geography, but not English because I was bad at grammar and that sort of thing. So yeah, but then, when I came to my later school, Caterham School which you’ll come to a bit later, one – I took seven subjects for my O levels and they were maths, pure maths applied … geography [sighs – pause], scrub that, I cannot remember the exact, but the emphasis was definitely on the science side and my – my – my skills were that side, not on the – the artistic or – or language side, bad at languages ‘cause of memory, I haven’t got a very good memory, unfortunately. Next question.

What – why – what did you like about the science subjects at school?

[Pause] Finding difficult to say why I liked them, obviously I liked the sort of science subjects where you made things go bang, or mixed chemicals together or that sort of thing, yes, very much so. Yes, I liked the practical side of these things, and in physics particularly, you know, playing with magnets or what have you, chemicals, making things that go bang, yes, very much so. But it – it’s deeper than that, it isn’t just that, no, I … I think I like defined subjects, subjects which have an emotional content into them … like literature or philosophy – more philosophical subjects, not so happy on. I like things to be defined and … yeah, defined, yeah. One and one is two … not one and one, well of course if it’s a bit rainy outside we might say it’s one point nine two six, no I think we better – but then if it’s sunny it might be two point – nothing like that, I like one and one is two.

Hmmm, so precisely defined?

Precise, precision, yeah.

Right.

Precision.

What was the teaching like, do you remember, you mentioned praticals a moment ago?
Practicals?

*Hands-on experiments on –*

Yeah, well in normal sort of experiments you would do at school. By this time I’ve gone to Caterham School, which we didn’t mention, why I won a scholarship at the age of eleven, quite good, there were four of us selected and it was – there were three levels of the selection process, so quite a hard thing but I – that was good. And the reason I – I got through I reckon was that my mother, as I think I remember – mentioned earlier, went to Croydon Library and bid for out of date copies as they occurred of various periodicals, and one of them I bought – I used to have and loved was the *Scientific American* and in – in that there was an article about a lock in the American canals between Lake Erie and Lake Ontario I think called Sault – Sault Ste Marie, I haven’t got it quite right, but somehow in my final interview with … Caterham School they said, you know, ‘What – what do you know about geography?’ and I said, ‘Well I know about the Great Lakes in Canada,’ ‘Oh yes, well what’s the difference between the lakes?’ ‘Oh, they’re different heights,’ ‘Oh, so how do you get water?’ ‘Well you build locks, such as the Sault Ste Marie,’ and that really impressed them [laughs] so in other words I was lucky in my – in my questions at my viva.

*Hmmm.*

[39:43]

Caterham School was a boys school, built late Victorian times I suppose, great big red brick buildings, it had – was a congregational school, it had moved from Lewisham or somewhere like that about thirty years earlier and it was built originally for the ministers sons of Congregationalists and their parishioners, but it would have lost its congregational flavour. Congregationalism was never forced down my throat in any was as a – as a creed. It was a boarding school, but it was half boarding, half day and I was a day – day pupil and I lived within about four miles of it and I used to cycle backwards and forwards to – to school, so it was country then, lovely country.
Hmmm. Did you have a particularly religious upbringing at all?

None at all, none at all, I’m an Atheist and my – my mother and my father both said, ‘We’re not going to have this child christened until it wants to be christened,’ so I was – they didn’t christen me at birth. My mother bounced in and out of religion … much – when my father died … which he did when I was twenty-one, quite a long time – twenty-two, something like that, after that, when my father died, then she – she had bounced in and out of Methodism and Church of England, but my father was I think an Atheist all his life and I’ve been an Atheist all my life.

Hmmm. So religion – sorry –

No, I was going to say that this made no difference at Caterham School; yes, I had to attend morning prayers and that sort of thing, but it – no religious teaching was shoved down one’s throat at that school, I’m trying to think if there was either Bible – if there was any even Bible classes, I can’t think there was. It was a lovely school and still is I suspect, in a country setting, up a long valley from Caterham and has – had at that time a lovely big playing field and new buildings round it and a swimming pool, hockey ground, excellent school. It had a number of boarding houses surrounding it where the boarders lived.

Did you make many friends there?

Yes, but I’ve never kept up with them. The war – I think my generation stopped people keeping up their school friends, many people keep their school friends into later life, but in my case, no, we all disappeared and many of them got killed of course into the armed forces, no, I … I can think of their names, but I don’t think I’ve ever been to – the other thing is, I’m not a joiner, I don’t go back to school reunions and that sort of thing, that applies all through my life, I don’t belong to British Computer Society for instance, and so on.

What sort of school was it really, was this from eleven on or …?

Yes, eleven on to eighteen.
And how – how did you win the scholarship there?

Well scholarships were offered to any boy attending a Surrey County Council school and what would happen is there were two scholarships, there was to the ordinary council – ordinary secondary school, and to – in this case to Caterham School, so what would happen is in the – in the appropriate year the headmaster would look down his pupils and say – and your parents would get a little note saying, ‘Would you like to submit your child for such and such a exam?’ and we did and so I did – I won both scholarships to the council school, the secondary schools and also to Caterham. So yeah, there were four of us went to Caterham from the whole of Surrey, but of course usually this was just the schools round Caterham as a town, so there were – there were four of us from what you might call an – an unprivileged background, went to the school, after a bit of trouble sorting out to who was who and punching each other on the nose we settled down to an amicable and after the – after the first few months there was never any problem, you know, everybody found their place.

Hmmm, but the fact that there was trouble at first then –

Well of course, I mean it – if – any group of boys you take together and put together will fight for territory and – and rank and position, absolutely, yes.

Was there – was there much of this sort of fighting at school then or just at first –

Oh yeah, oh yes, yes, yes, yes. Yes, gangs and people punched, oh yes, nothing abnormal about this, I’m sure if you went to modern schools it would happen, it’s a natural thing for a gang of boys to do.

Were you in a gang yourself or –

Well gang’s probably the wrong word … not a gang in the way you would interpret nowadays in a rather sinister way no, no. No, group of friends I think is a better way of looking at it. For instance I had to go home every night through the countryside, push my bike up the hill and cycle about a mile from the top of the hill to my home,
then I – there would be a group of chaps go together with me up this hill and, you
know, we’d be friends and yeah, yeah, and perhaps at weekends they might come to
visit me or I would visit them. But not greatly, I wasn’t a great joiner. Oh lots of
things to join at school, it was well run from that aspect, you know, there’d be a
scientific society and there’d certainly be a … a theatrical performance every year,
like The Mikado or what have you, so that was good, yeah, it was a good school,
excellent school.

[46:01]

What activities did you get involved in at school?

Well as I say, that case … theatricals and when the war came along it started a branch
of the ATC … the – well ATC is the Army’s – ACT, Army Cadet – dear oh dear,
ATC is the Army something Corp, but anyway I joined the RAF equivalent of this
and I’m trying to think what the initials of that was, but we had a blue uniform and a
nice peaked cap and learnt various things like Morse and what have you, not as
successful as it might have been – not surprising really when you think the RAF was
cond – particularly concerned with keeping us surviving, let alone messing about with
these kids. But anyway, it did help, it did help and I think when I came to get an RAF
commission it helped too.

What sort of activities did you do in the training group then?

Not a great deal. In fact the – the two masters that had the job of looking – you know,
doing this had difficulty creating a reason for us being because we could not really
integrate in any way with an RAF physical unit doing anything because of the war on,
you know, Kenley aerodrome was near us and was being shot up by the Germans all
the time and that sort of thing, so …

[47:35]

Do you have any particular strong memories that stand out of being at school?
… Well many memories but the – one interesting one was that because the war came along we were taught to drive tractors, so a Ferguson tractor appeared with a plough on the back and we ploughed up some – some spare land which was quite interesting, which was good fun. I was also – when my parents went away for holidays during the holiday time I used to become a boarder and things were much easier then, I used to take my shotgun to school and shoot rabbits ‘cause they wanted rabbits shot in the ground, now it’s something that would not happen nowadays under any circumstances, which I thought was very sensible, so I shot the rabbits, yes.

So you got to take a gun into school then and –

Yeah, kept it in my locker and keep locked, yes. But I think this again is typical … I was given more responsibility and … yes, just responsibility and I suppose I became an adult – and an adult attitude to things very early, never – never reoccurred to me to misbehave with the gun, no way, ‘cause it was a dangerous weapon, you know, had to be looked after and so forth. And the cartridges had to be kept there and the gun over there, so people couldn’t join the two together, nobody told me to do this, it was just sort of, yeah, the way you – you would behave.

So when did you learn to shoot?

Oh much much earlier than that, eight or nine. ‘Cause we lived in the country, I had an acre of ground with a wood – half of it was wood, great big beech tree at the bottom where pigeons settled in and, yes, I went and knocked those down now and – and my father gardened like fury so hated jays so I would shoot jays and, so yeah. Yeah, so country education, yes.

[49:43]

What was your home like?

Very relaxed, very relaxed. I was an only child, I haven’t mentioned that, only child. Nice home in the – in the country, my father was a gardener, gardened like fury, I had nice – good friends about half a mile away which we spent all the time out in the
country doing something, either building camps or – or shooting, or all sorts of things, birds nesting, yeah, all sorts of things, gathering fruits and mushrooms and, oh, typical country lads.

_Hmmm._ Could you elaborate on that a little – I grew up in a small town so I’ve got no idea what typical country lad activities are [laughs]?

Well, firstly children are spread much more thinly, so you have to go walk or cycle perhaps half a mile to meet your friends and then you say, ‘Oh, let’s go – somebody says there’s a so and so down so and so, shall we go and find it?’ so you go and have a look at a fox den or something, or in my case some rare birds, like a butcher bird which you don’t hear about nowadays, and so on. Yeah, just messing about in general, and then we’d go to perhaps a – a – a chalk cliff, chalk mine, chalk quarry and get ourselves absolutely filthy and come home. It’s like – my poor mother did have a time of it, but she was very supportive. For instance, if I wanted to build a fire, which I did in our little wood to cook my food, she’d produce a frying pan with a sausage and some fat in it and bread and, ‘Go on, go and build your fire,’ you see and so it – very hands-on and supportive.

[51:27]

_You mentioned birds a moment ago and were you that interested in nature when you were growing up as well?_

Oh yes, very much so. [Laughs] Not – not in the same way as bird watchers are now, who want to tick it off on a list, not in any way like that, no, just they were – things were about and they were worth looking at if you could see them, like foxes and squirrels and badgers and so on. Not many deer, there was one or two deer but very very short on deer. Partridges of course which we shot, yes.

[52:00]

_Hmmm._ What other sort of entertainments and activities did you enjoy?
Well in the school, in – sorry in the village there was quite a lot of village activities which perhaps you wouldn’t get now, particularly as a theatrical society which I joined and we did a whole lot of series of plays, pretty terrible they were too looking back but we did them and filled the village hall with our relatives mostly to watch these things. And of course the war had started towards the end of my career and the war brought the bombing raids and brought civil defence with it, and I was a messenger to the local ARP, I’ve forgotten what ARP stands for, but anyway it was people that had patrols and a system for watching out for bombs and any other activities from the enemy and reporting it and getting –

"Yes, is it Air Raid Precautions?"

That sounds just about right to me, and yes, I was a messenger which meant I had a little badge and a nice tin hat and a – and a – I had – and also I used to have – do patrols on my bicycle and also I was allowed – we – there was a meal allowance so I had a nice supper which was cooked by the – the warden down in his pit, the – these warden – this – the air raid – the – the – the meeting place that the – that the office of the wardens was down some steps underground, so if there was a bomb, and there was in fact, it wasn’t – it wasn’t hit, you know, it was very – so bombs did drop in – quite near, but they were on the whole reasonably small and didn’t actually kill anybody, they smashed up a few windows and things. We had a rather peculiar bomb dropped just outside a house which was called an oil bomb, the Germans made these huge bombs full of old oil, used oil, the idea being that it had a detonator and if it dropped on a – on a town it would make a jolly good blaze, the fact that this was dropped on a hedgerow in the middle of the country was rather a waste of a – oh that was the other thing of course the German bombers often didn’t want to drop their bombs on London, to hell with that, we’ll dump them on the countryside and go home, you know, so the bombs did drop all over the place, most of them doing no harm at all, but the fields had craters in here and there, and of course one lovely winter in a way the German – probably the winter after the Battle of Britain, they dropped a whole load of incendiary bombs in a wood, and it was snowy and it was a beautiful sight with this wood full of these burning incendiary bombs, incendiary bombs were on the whole not – not lethal, but one of the troubles was about one in something bombs had a little explosive charge at the end of their – the fin, so that when the bomb burnt down the
explosive charge would go bang, this was, you know, to discourage people from trying to put the fires out, but that’s the war for you. And we scour – as children we scoured every morning after a raid, we went out through the woods and went to see, you know, what we could find in various ways, well you found all sorts of curious things, yes, that had been dropped. One of them was a parachute, about eight feet in diameter, with a long length of steel wire, and on the other end it was an explosive device, and the concept was that an aircraft would drop these above the – the German bombers and the wire would catch over the front wing of the thing and the parachute would pull the wire across till the explosive device hit the wing, whether this worked I don’t know, but this was just lying in the field so we would get that and disconnect the explosive device and take it to the bonfire and make it go bang, and oh yes.

*Sounds awfully dangerous [laughs].*

Well it is, unless you’re sensible and think about these things, yes, yes.

*How did you come to join the ARP as a messenger boy?*

Oh I can’t think what the recruiting process was, I don’t know, no, no. Probably just word of mouth, it was a village, yes. You know, ‘We want you as a messenger, will you?’ ‘Yes,’ you know, it happened, yes.

*What – what sort of duties would you have to perform as –*

Oh very little, as I say, in fact they had to think of things for us to do. Mainly just cycle round to see if anything was amiss. Which we used to do [both laugh].

[57:08]

*We’ve talked quite a bit about the war there and I was just –*

The war?

*Yeah, yeah.*
Well let’s just think, one thing of course was when the Battle of Britain was on and I was still at school and we were at that time, in that summer it was a June, we were harvesting – helping the harvests, gangs of us used to go out with a teacher to a big local farm and do the stooking and putting the … the sheaves up in – in piles to dry and the Battle of Britain would be whooshing about above us which was dramatic, what would happen is you’d hear the air raid siren go and then about the same time the air – the fighters would take off from Kenley Aerodrome which was near us, squadrons of, in our case, Hurricanes would take off in ones or twos and then formate into threes and then formates into squadrons and then climb up up and up and up and that was the first time that I’d seen condenser trails, most aircraft never went to the height that would leave a condensation trail in the sky, but when the German bombers start to come, then the – the battles were at eighteen, twenty, 22,000 feet where these condensation trails were, so you’d see the German condensation trails coming along and the aircraft trying to come up and then the whole thing would break down into chaos as planes went in all directions, dog fights here and there, and then some aircraft crashed, not a great number, but you would see occasionally an aircraft – aircraft going down and some crashed near us and we’d go and have a look, you know, and see the hole in the ground and so forth. Hmmm, what else did we see? Kenley got a real bashing at one time, killed four WAAF’s and it was a – by the way it was a – a grass aerodrome then, they wouldn’t have … tarmac runways at all. What else to be said about the war? We used to – one interesting thing was there was an attempt to educate people in – about poisoned gases which they thought might be used and there was a meeting in the village hall about detecting different poisoned gases, so little files with cotton wool in and – and some chemical in were sort of passed round and the man said, ‘You know, this isn’t the real stuff but this is what it’ll smell like,’ which was interesting, so there were … duplicates, there’s a word for – for mocking up a – a model of, an example of, not quite the same, there should be a word for it but I can’t quite think what it is, so we went to the village hall and we all sniffed this stuff and said, ‘Oh that’s mustard gas, or that’s luicite,’ or whatever the particular ones that were supposed to be nasty. And what else happened in the war? On the whole the rations in the war were adequate, not brilliant, and not … necessarily very tasty but adequate and one existed, one lived, and one of course had ration cards and all that sort of thing.
You mentioned the Battle of Britain a moment ago, I was just wondering what it was like being a spectator to it as it was going on?

Oh it was grand if you were a child, oh yes, you know, you were immortal if you were a child. Oh yes, that was a grand – hardly any sense of fear, the most sense of fear I had in the war was later on, after the Battle of Britain when the bombers were flying at night to London and they flew separately, they didn’t fly in formations, you would hear a buzz there and buzz there and so forth and the searchlights going all around and we had a searchlight just down the bottom of the road and the light that searchlight gave off was absolutely fantastic, you know, we were probably a quarter of a mile away from the thing and the whole – just the bouncing off the clouds lit up the countryside. Anyway … what was I going to say about – oh yes, the fear was that if there was one plane buzzing away across here and it was dark and you were alone in the countryside, you sort of felt that bloke knew you were there and was going to drop something on you, quite absurd but it’s how you felt, one had – I felt anyway. So … and then after the Battle of Britain the Germans turned their attention to London and then the night raids started and then where we were on the North Downs you would see the whole of the horizon over London red with the – the fires in London, you couldn’t hear – well you could hear the anti-aircraft fire of course, but you couldn’t hear the bombs dropping from where we were ‘cause you were about twenty miles away … trying to think of anything else about the Battle of Britain.

Were you at all worried about the outcome?

Oh no, oh no. I don’t know why but for – not for one moment did I ever think we were going to lose the war, you know. I was a child of course, a child and also … that the … Ministry of Information and the – the manipulation of the news made you feel like that. Bloody right too … absolutely right.

Do you remember where you were when the war broke out?

Not particularly, no, not particularly. I know that we were particularly … well of course we were listening to the radio all the time and I remember Churchill’s
statement which – I can’t – it’s, ‘They’re not responding to our ultimatum and therefore we must consider yourself at war with Germany,’ I think was the phrase, something like that, that was Chamberlain. The effect of Churchill as a man was terrific, his choice of words and his stalwartness and his complete sense of determination, I cannot overemphasise how important that was to the nation.

_How aware were you of that as a child?_

Oh very much so, I mean yes, it was an emotional thing, very strongly. We would listen to him on the radio.

_Which emotions?_

Oh, patriotism, determination, all the things that you should have if you’re fighting a war I suppose and that’s what you are programmed to do.

_Programmed?_

Yes, by the news that was released to us by the Ministry of Information. [aircraft noise in background] There we are [both laugh].

_Hmmm. How – I – did you listen to the radio a lot then or –?_

Oh yes, very much so. With living in the country of course the radio … was far more … I suppose you could call it middle class … there wasn’t the great mass of popular entertainment on – on the radio that there was, there were humorous programmes, yes, and I’m trying to think of the ones that were on in the war and I can’t remember the actual names but they were humorous programmes in the war, and there were the – there was the news, and there was quite a lot of – of quite good talks, very much so. My mother was always listening to French radio ‘cause she – she – as I said she was an autodidact, taught herself French and I – that sort of soaked into me too a bit. What else about the radio?

[1:05:46]
Oh yes, one quite humorous thing, my father who was skilled with his hands, carpentry, built a loudspeaker into the dining - into a corner of a room, cut off the corner of the room and there was the loudspeaker built in, and it had a fret on the front of it and he’d done this about 1936 I suppose, and the … the – the front of the thing was a – had a – [ph] design in it, which was the … the good luck symbol, which was a swastika of the – but not in 1936, the good luck symbol was a swastika, and then the war came along and a swastika had a – you know, terrible implication then, so the – the two limbs were cut off that way [demonstrates] and the little ends, so it just became a cross with the centre thing in it, so that little modification was to … still the – with criticism we felt, that would.

[1:06:52]

What other technologies were in your house?

Technologies, well my father built radio sets and I built little ones as well. Second-hand fridge which was a gas fridge of all things, very early washing machines, we weren’t very rich and a lot of this was bought second-hand at auction sales, my mother was a great auction saler and … washing machine was a Beatty wooden tub washing machine, rather like a section of a barrel, with a big metal lid that closed down, with a shaft down the middle and a – and a belt drive to the top from an electric motor, all open, very late – dangerous in – in modern things, which worked a paddle inside the washing machine. And then there was a – a wringer on the back of it which worked both ways with a left and right with a big handle that worked where she could send the things to to give them the wringing.

You had a refrigerator as well, that’s –

Yes, only a very small refrigerator, not more than a foot by a foot by a foot and didn’t hold very much and we hardly ever used it strangely enough. We had a cool larder, had a – what else to be said about domestic arrangements? During the war of course everybody cultivated like fury and we kept chickens which laid eggs of course and sewed things like fury. Also we gleaned – when the harvesters had been round the
field we went round gleaning the bits of wheat ears that hadn’t been gathered up by
the harvester, took them back and rubbed them, made the wheat for feeding the chicks
and that sort of thing.

_Hmmm._

Then of course we saved nuts all the time, hazelnuts, conkers, sweet chestnuts …

_How typical –_

Shot rabbits – what?

_Sorry, I’m just wondering sort of how typical were things like washing machines and
refrigerators in other houses?_

Oh, they weren’t very typical, no, they were not. My mother who was forward
looking in this sort of thing, would get these things at auction sales, and my father if
necessary would make them work. One thing she did buy which was interesting, and
exactly at what time I can’t remember, but this was a kitchen cabinet … possibly six
feet high by five feet wide, and furnished inside with jars with labels on, flour, sugar,
milk and that sort of thing, the top of the thing was made of vitreous iron, what – yes,
you know … vitreous surface so she – you could use it for making pastry on and
plaster and that sort of thing, all the drawers were underneath with – one drawer
would have a place for putting towels and things in it, it was all fitted out, that’s the
word I’m thinking, and that was a revolution, it was an American device of course, as
so many of these things were.

_Hmmm._

Had a telephone, old fashioned telephone with a – with a lady at the other end.

_Did it get used much?_
Did it get used much? [Addresses pet] Now you have not been a clever dog. Excuse me for a moment.

*Shall we just pop this on.*

[End of Track 1]
Track 2

[Inaud]. You mentioned your mother was forward thinking a moment ago, I was just wondering if you could go into that in a bit more detail?

Forward thinking … she had an alert lively mind … [sighs] she – we were all apolitical, we didn’t belong to political parties in any way, don’t know why but we didn’t, but were interested in – in art and she used to take me to … many exhibitions in London, that sort of thing, you know, Royal Academy. Science Museum, I used to – that was a great effect, the Science Museum was my joy, it – it stimulated me terrifically, with all these machines, you could turn handles and press knobs and things, and also Foucault's pendulum, this great long pendulum which swings and as the earth revolves the pendulum keeps on swinging in the same direction, but the earth moves under it so it looks as though it’s doing that. That was terrific for me.

Then there was the science – the Natural History Museum with the – the dinosaur and all the other bits in there. Geological Museum, Vic & A, yes, excellent, I used to go up and there and see all that lot and my mother used to. She always used to – when – every Saturday we used to go to Croydon for shopping, there was a place called Surrey Street where all the stalls were and it was a – what do you call it? A game of nerves, because no refrigerators, so the – the stallholders had to get rid of their stock on Saturday night and so it was – she’d walk down and the man would say [adopts cockney accent], ‘Come on lady, only four pence a bunch,’ ‘Oh I don’t know …’ ‘Well what about three?’ [both laugh] and this’d go on till eventually just as the whole stalls were coming down a deal would be struck and she’d come home and say, ‘Look what I’ve got here.’ And also same thing happened in a different way, a very good caterer indeed in – that did high class pastry catering, and sold wedding cakes and all this sort of thing, very high class, on a Saturday would put a table out, past – behind its workshops, which were quite a way out of the town, and all this stuff that they hadn’t sold or couldn’t sell was piled up on there and you never knew what was going to come out, sometimes it was a wedding cake and you would buy a wedding cake and that sort of thing. So there was a lot of that sort of recycling, and of course the market was full of that sort of thing, much more than – that now, all sorts of deals going on in – in … what do you call it, Surrey Street where the sales were. There were butchers there that would chop things up of course in front of your eyes and say
oh – you’d see this thing and, ‘I’ll have that bit’ and so it was chopped off. The – there weren’t any supermarkets then but there were big firms that ran multiple purpose shops, like Gregs, international stores and so forth where you went inside, often the – the floor was covered with sawdust, and a butchery – butchery down one side and that sort of thing, vegetables down another and so forth. The – what do you call it? When you – in the big shops like Grants and Selfridges and Alders in Croydon … change was given and money was given via these things where you put the money into a little container, put it down a pipe and it would suck away, whoosh, pneumatically to the – to the till where the girl would sort it out and send the money back, or alternatively it would be on a wire, where the money was screwed into a little carrier with two little wheels and she’d pull a handle and it would shoot off across to the – to the – the operator who was probably twenty or thirty yards in a big cage at the top. The – the same stores I think Cambridge – Grants, Alders, and Kennards are still in – in Croydon, I don’t know. Kennards was always down-market.

*Down-market?*

Down-market, cheaper lines … more special lines in various ways, not so snooty and calm as say Grants was.

*Hmmm.*

But they also had the sales, just so they do now and that – my mother was way into those sales. The other thing that might interest you is that she bought good quality clothing from a magazine called *The Lady* where – where people who – aristocratic ladies or higher class ladies were selling dresses or whatever you – have you and then an advertisement would be, you know, ‘Grey dress, such and such a style, waist so much, bust so much, made by Balenciaga, or whatever some – and of she’d send for this and the dress would come back and if she liked it then she had it, or she’d alter it, she could alter it, she’d often take it in of course if it was too big, so she could make a good waist on it, so she’d do that sort of thing, she did a lot of dressmaking. Dressmaking of course was done with patterns, little printed tissue paper with numbers on and ledgers on so you would have sleeves and you cut all these bits and if you assembled them correctly you’d get a dress. Very successfully too.
And you’d watch her do this at home or –

Say again?

And you’d watch her do this?

Oh yes, oh goodness me, yes. Oh yes. And of course sewing machine, Singer sewing machine well into the fore, and ironing, yes, yes, yes, yes, yes.

You described your mother as an autodidact a little while ago, I was wondering if you could expand on that?

Well she taught herself, particularly French, to a very high standard when she listened to typical French players, like Molière or whoever it happened to be, on the French radio, on the French radio. And then she’d buy books on what things she wanted to know about, art for instance she’d – she’d get the books out of Croydon Library which was terrific, Croydon Lending Library was absolutely superb and she’d come back with a Velazquez or Degas or whoever they happened to be. And then we used to go to see exhibitions of art, what I used to enjoy.

[06:56]

We – cars, I better say something about cars because we lived right in the country, a mile from – well half a mile from the nearest little village shop and a mile from decent shops and the connection to the bus service, my parents had a car, very early cars because most people couldn’t afford a car, but we had a car called a Jowett which was British built in Tamworth, it was two cylinder horizontally opposed car, the cylinders were like that and the pistons went like side to side, good little sturdy little cars, made a tut-tut-tut-tut noise, yep, excellent.

What sort of trips did you use it for?
Oh, my father built a caravan for ourselves ‘cause he was a carpenter by – well he was a carpenter by trade to start with, but he – because he just liked carpentry and built a lovely – one of those types of caravans that weren’t rectangular, they were square but the back curved under and so the roofline went along and then swept round and under at the back, and this caravan was towed behind the Jowett and we used to go on holidays with it, particularly up to the Lake District, various other places, excellent. Didn’t go to the continent with it, no. Overseas travel, no no no, that was interesting. My father actually went overseas on holiday once and that was to Ireland, that was quite a thing when he went overseas. My mother used to like – ‘cause she was more am – you know, ambitious, my father tolerated my mother in the nicest possible ways, if she wanted to go on a holiday to France then she could, so she used to take me to France and we used to go to – what do you call it, provincial France, not in – not on Provence, I mean out into the countryside and lived in a hotel or something, or little tiny hotel in a farm, and that was good, I enjoyed that very much. And went across on a – that meant going across the Channel on a – on a boat and because the boats were much smaller, the waves seemed to be much rougher and almost everybody was sick and it really was, yeah, quite different from nowadays with stabilisers and what have you.

_How – how – what was it like travelling abroad at this time?_

… I find that difficult to answer because of course my mother did all the negotiation, but as she knew French there was no problem, and we caught buses everywhere and in third – the – the third class compartments, hard compartments in the trains and the – the trains burnt smoke – burnt coal with a terrible stench of smoke and got filthy, ‘cause all the smut came into the trains, trains were not necessarily clean and [laughs] what have you.

_Put it another way, how different did say France seem to Britain?_

Ah, one thing about France should be said, France suffered terribly in the First World War, the loss of the male population in the trench – in Flanders trenches was terrific, leaving vast quantities of black widows, so French – France in 1926, ’28, ’30 when I went there, say make it 1930, ’32 that sort of time, black widows were everywhere
which was very very sad, also it was – seemed much more run down 'cause of course it had taken a hell of a pasting in the war, all the … buildings were flaking and the … plaster on them was coming off and that sort of thing, the women were very house proud and used to hang their mattresses and blankets out of all their windows every morning. The other thing is there was a thing called octroi which you don’t hear of now and that is individual taxes when you go in and out of a town, so at the start of a town there would be a customs post where you’d pay customs on certain things, not human beings just going in with a little thing, but I think things like … loads of vegetables or what have you would be taxed at these places, but that’s gone thank goodness. Well in fact it’s [laughs] – with the European Union it’s gone between countries now.

_Hmmm hmm. How different did France seem then, was it very different or not very different?_

How – how different was it? It was different because of the language difference and television wasn’t with us and France was France was France, it hadn’t been invaded by the American English accent and that sort of thing. And of course the countryside was far more isolated than it is now, it – people didn’t travel as much in the country so if you went to somewhere like Normandy, then you saw people in Normandy costumes and as quite naturally, not just ‘cause it was a Saints day or something. Am I going to throw you out in time?

_Oh no, I’m still good for time, I’m –_

Okay, good.

_As long as you’re happy carrying on I’m happy to listen._

I’ll carry on for a bit, okay, good good.

_Fascinating._

Why don’t you find out a train and we’ll select it and then we’ll –
Okay, okay, I’ll pop this on pause for a moment. [Break in recording]. Right, I’ll pop that back on record and we’re going again.

Good good good.

Hmmm.

I’m just thinking about the – the war and again whether – anything around that time I should say. Oh yes, I mentioned that people worked in the fields, as a schoolboy during the war I used to go and earn money from local farmers, but the bastards were so mean they only paid sixpence an hour so I gave that up, my patriotism didn’t run that far.

[Laughs].

[13:07]

Did you have pocket money as a child?

Yeah, yeah I suppose – I used to save my pocket money, was a bit [inaud] in spending it … I’d spend it on things like aeroplanes, Warneford aeroplanes, there was a company called Warneford that made aeroplanes with a stick – bamboo stick body and – and silk covered wings, or wax cloth wings and elastic from tail to – to front and a propeller and you – and these were great and I used to love them. In fact I went in for model aeroplanes terrifically and they used to get bigger and bigger and more elaborate, they were balsa, covered with tissue, doped to make them tight, big nice balsa wood propellers. I would spend time building these lovely aeroplanes, it would be howling with a gale outside, I must go and fly it so I’d take it outside, launch it and it’d go straight into the hedge, smash itself to bits, back to the drawing board, but luckily you could mend these things fairly easily. [laughs]

Hmmm. Do you remember how much pocket money you got?
… I would think it would be a shilling a week if I – I used to leave it in a top drawer and my – my mother when she used to want change [laughs] she used to take some out and leave a little strip in, ‘I’ve borrowed two pounds,’ or something, no, not as much as that, two shillings worth. I never felt the need for more pocket money, I was very reasonable and felt very happy, yeah.

_Hmmm._

[15:05]

**What else can you tell me about your mother, she sounds a very interesting person?**

… Yes, she was her own creature …

_Give me just one second, pause. [Break in recording]. Good … did she have a job or …?_

My – her – her parents … were working people, my grandfather was a foreman in a hot warehouse in the City of London and travelled from Thornton Heath, Surrey, where their home was, to London daily on the train, southern … terraced house, built 1905, bought it from new, 150 pounds it was … quite a big garden, fruit trees in … inside and outside loo which was remarkable. Gas not electricity … back boiler behind the stove for hot water … the … drawing room was a very special room used only for – which was the front room on the ground floor, only for social occasions with the piano, because my father played the piano and we all sung at various times to it, but very Victorian in furniture with masses and masses of nick-nacks all around the place, little doilies, little woven mats, spills for lighting cigarettes, which were curly bits of wood from a plane which you kept in a – ‘oh I’ve got a spill jar’ and you used to light these from the fire and then use it to light a cigarette or whatever it was you wanted to do with spills.

**So your parents smoked?**
My father smoked, yes, a pipe all the time, which had to be decoked and scraped and messed about with and sometimes had a filter in it, my mother didn’t smoke, no. Trying to think what else to be said about my – my parents?

What – were was your mother actually from originally?

Well Croydon, Thornton Heath Croydon they were – they were born and she – she was brought up there. Wrong – wrong, wrong [sighs] … no, they moved to Croydon from … a suburb nearer into London like Clapham Common where she – she was clever ‘cause she – she earnt a scholarship to a local secondary school, as did my father, and then they moved down there. My parents met at a congregational church incidentally, where my father used to sing, got a good voice … my grandfather liked me ‘cause I was a boy and used to take me to see Crystal Palace play football … on their ground, which was exciting for me ‘cause there were great crowds of people, we used to travel by tram, trams were the travel of those days, great big clangy clangy trams.

[19:02]

Did you do much sport?

Me personally?

Yes.

As little as I – I had to. I mean at school I had to do sport, but swimming, I did an awful lot of swimming and I was very good at swimming and I loved the fact there was a swimming pool and we played water polo and all sorts of swimming sports and things, yes, very much so.

Where was the swimming pool?

At the school.
Oh right.

Hmmm … at the school. There was also a swimming pool down in Caterham Valley called the Mountain Pools which was a privately owned school – pool which had three different sizes of pool and … big grassy lawns round it and you used to go and spend a Saturday there, all that sort of thing. And as a boy you’d go and chat the girls up there, that was – that was good.

[Laughs].

[19:59]

Did you have many girlfriends?

Hmmm … intermittently yes. A friend of mine, Stanley had a sister, Nellie, funny, there’s a Victorian name, my girlfriend for a bit, but she was older than me and she soon got rid of me and got a much more attractive lad. When I was at Caterham School there were two – two girl pupils out of all the men, which was quite extraordinary, they were doctors’ daughters and for some reason were – in the sixth form this was, right at the top of the school … they were there because their parents wanted them to be doctors and therefore they had to do biology and the school had a biology course, and so I got friendly with one of those, all very innocently I’m sorry to say … yes, nice girl, used to play tennis together, walk home together.

Do you remember what her name was?

Yeah, Cynthia Gordon and Mr Gordon was the doctor. Hmmm … what else to be said?

[21:24]

But I spent a lot of time during my pre-teenage years, well and in my teenage years in the countryside, because we were in the middle of masses of country, either shooting or walking or doing this that or the other, going and looking at an attractive rubbish
dump or something. The land between us and Caterham, which was farmland, was originally owned by Caterham Lunatic Asylum which was a big lunatic asylum in Cambridge – Caterham, I’m trying to think what its title was, but anyway we’ll call it Caterham Lunatic Asylum and during the … I don’t know when, the fields had concrete … gutters built, horizontal gutters right along the top of each field, all interconnected with pipes and the concept was that sewage would be put into this and – and taken and released from these gutters to – to flow down the grass and – and nurture it ‘cause it was dairy farming, and all these – by the time I got there these weren’t used and they had all fallen to bits which was a shame, and then also there was the guards barracks in Caterham, near to Caterham, where all the Coldstream guards and the Scots guards and so forth, and very tough soldiers there indeed and you’d see them sweating about and being bullied by sergeants all over the place, so they were there … travelling fair used to come round and park on Coulsdon Common and you could hear the old calliope as they would call it in America, the roundabout churning out its organ music, that would draw us all in.

**What were the fairs like, what did they consist of?**

Well not much different from now, the same sort of things, you know, you threw things to see – knock things off things or there were shooting galleries, the same thing, no, no, I can’t think of anything that was abnormal – that was there. Bumper cars were great fun, they were new and that was grand. But not very big, no great – great big vertical wheels. But the old roundabout with the horses were there for sure.

[23:51]

*You’ve talked quite a bit about your mother but not so much about your father, I was wondering if you could tell me a bit more about him?*

Sure, quieter man than my mother, very practical man indeed for carpentry in particular and made all sorts of things. Got into – make radio sets very effectively, in those days you used to buy individual components to make your radio set, I’m going to buy a condenser or – or coil or base for this or a loudspeaker, and you bought all the bits and soldered them up, which was effective and worked very well.
So – so would he build the actual radio inside or just the box on the outside or –

Oh no, the lot. Oh the lot, yes, you would have – he would have a sheet of – of metal and drill it to – to mount all the components in with nuts, everything fixed together with nuts and bolts in those days, so a capacitor would sit down onto a metal sheet with two little nuts to hold it in position. You know. Have one of these, they’re good. [passes food]

Oh thank you.

They’re nutty, are nuts all right.

Nuts are fine, thanks.

I had a sudden thought there.

[Laughs]. Where did he work, did he work in your home or did he have a workshop or –

Oh he worked at home in the garage, he had a workshop at the end of his garage with all the tools you would expect, and many of which I’ve got, you know, saws and chisels and so forth. But no electric tools, no electric tools at all, everything was worked by hand. What else to be said about him? He loved his garden, and he liked making things … we did have electric mower which was quite remarkable for those days. Sorry, I said electric, no I mean – should have meant petrol mower, a great big – yeah, press on, great big … Ransome mower, cast iron frame each side … [eating] we had a lot of grass because it was, as I say, a one acre garden and half an acre of it was mostly grass.

Hmmmm hmm. Did you get to ride round on the mower mowing the lawn or –
Oh yeah, I used to mow the lawn in fact, yeah, of course. And I remember borrowing it and lugging it, three of us, my two pals and I, lug it across a great field to – to their garden, so that I could mow their lawn for them, it really was not worth the effort.

[Laughs].

Can’t think what else to be said about … being in the country.

*Hmmm. What was your father’s name?*

Hmmm?

*What was your father’s name?*

Cecil Frederick Bird. Cecil, there’s an old fashioned name.

*Hmmm …*

His sister’s still a – no, she is dead, no they’re all dead now, hmmm.

*How did he feel about his job?*

Very happy doing it. As I say, he was a quantity surveyor, quantity surveyor does all sorts of things but typically he might take an architects plans, convert that into a list of quantities, need so many bricks, so many square feet of this and so much paint and so forth, then cost it and go out to tender if it was for tender, so … an architect might ship the plans out to several people who – who come back with bids as to how much it would cost to do and … the – all this has been computerised now as you can well imagine, but it meant he had to choose what paint, what cement, what wall covering, all these sort of things, so he’d have catalogues for the – from the various suppliers … to – which he would choose what particular he wanted and these companies would send him Christmas boxes in – just before Christmas, particularly Daltons who did a lot of sanitary ware, but Daltons did superb pottery as well, so he’d get nice – they were usually seconds, let’s be fair, but very nice indeed.
Hmmm, so did he work for himself then or for another company?

He worked for other companies for many years until finally he and another chap branched out and formed their own company. They did good business in the middle of the war and the end of the war, because of course as you can imagine, bombing created fantastic amount of building work, the government paid for many of these repairs and the – the quotes had to go in in a certain format and that sort of thing …

Hmmm, did he work long hours or –

Not abnormally long, no, I can’t remember him having to work excessive hours no. During the war, out of another thing I should say, was he went to work for, or was conscripted by, I don’t know which, I think just went to work for the Admiralty at Bath where they had – of course the Admiralty had vast premises doing this that and everything, so that was again quantity surveying on that. And he was separated from my mother during that period, ‘cause she was at home and that was that. My mother by the way in the war, I’d forgot to mention this, became a VAD nurse, Voluntary Aid Detachment Red Cross nurse, so she had a uniform and she was paid for this and she had to turn up and man their post, which was in Caterham away from where we were, for which she got a petrol ration, because you got special petrol rations for all sorts of things, and … she did that and there was all this bit – then there was all these … mock accidents where they used to train, where they used to be all spluttered up in mock – mock blood and – and wounds, some of the wounds were terrific, those made with putty, you used to put putty on your – on the arm, as you can imagine, draw it in like this, spread it open like that to – to make a – a sort of deep cut and then fill it all up with – with red gore, it – quite – and it used to let it dribble down the arm, it was quite horrendous – people used to faint when they saw it. In fact that was the object, to get people used to being able to tend wounds without fainting, ‘cause a fainted nurse isn’t much good.

Hmmm hmm.

[31:03]
You mentioned that your mother and your father met at a congregational church but you also said a little while ago that they weren’t that religious, I was just wondering how that worked [laughs] so …

I think it was … the … done thing, it was what that generation of late Victorians would do, my mother was born … 1894, my father 1897 or vice-versa, so they’d started life as sort of Victorians.

_Hmmm, what was your mother’s name, I don’t think you’ve mentioned that?

Marie Louise Bird. Though she was commissioned – commissioned [laughs] – christened [laughs] Louise Marie but she quickly turned it around, she thought Marie Louise sounded better, I think she’s right.

_[Laughs]. Were you ever christened yourself, you mentioned a moment ago but –

Never, no no, yeah.

_Hmmm._

_[32:12]_

_Hmmm, so your father, would he have been in the First World War then or –

Now good question that. Yes, he jolly well would have been if he didn’t have what’s called Ox Heart, if there’s – the muscles of the heart have bled and become atrophied, the body substitutes for this extra muscles round it and the heart becomes very much larger and it becomes Ox Heart, my father hadn’t really known this, he’d been quite happy and played football and everything and very much he played football, he ran a football team, but he and my mother laughed at their good luck that he was … he was in a reserve – no, he wasn’t in a reserved occupation, he was just not wanted, what’s the word, wasn’t turned down, he wasn’t recruited and – but eventually it did kill him actually, when he was about fifty, fifty-five, so it got him in the end.
Have you inherited any of his characteristics do you think?

Oh [laughs] … yes, my skill with my hands but my – oh and it was fairly phlegmatic … I think I’ve inherited – inherited my mother’s intelligence and brightness and inquisitiveness and willing to – to explore and all that sort of – ‘cause she was very much like that, yes, so I think we’re a good mix, my father was a good solid chap.

Hmmm. What was his relationship like with your mother?

… He was extremely fond of her … and she was of him … but I think their marriage settled down to where they tolerated each other, I don’t think towards the end of the marriage it was – marriage of convenience sounds a trite phrase but, you know, she did her side and he did his side. He brought the money in, she kept a good house, cooked well, good clothes, you know … but then she had many – many years after he died. He died when I was on my honeymoon which was sad, so we had to come back, we were in the middle of France.

Hmmm.

[34:52]

You mentioned right at the start of this interview that you had typical middle class upbringing, I was just –

Well what – what did I mean by that?

I was – yeah, I was just about to ask actually [laughs].

No, I’m just trying to answer that too. Yeah … not working class, there was nothing brutal or hard or stressful or need for money or keeping up with the Jones’ or that sort of thing, neither was it upper class where … one fitted into a circle of upper class friends, in no way. No, I – middle class is about all I can think.
Hmmm.

[35:42]

What about your grandparents, were they much impact on your –

Grandparents … my father’s grandparents had three children … one of whom Bessie died young of one of these diseases we don’t hear about now, like chickenpox or measles or one of those diseases. So two children survived, my auntie Edie who lived a good old eighty-five emigrated to Australia to be with her daughter when she was eighty so [laughs] – and she was a – a fighting woman, and she had a tough life because her husband had a stroke which left him semi-invalid when he was forty, so she had him for twenty-five years or so, nice – happy, nice, quiet but a semi-cabbage, so sad. Right, that’s – that’s those. [Closed between 36:45 – 37:27]

My mother’s grandfather was one of five or six boys, brought up in Suffolk as farm labourers boys, children, and they all had name like Willy, Charlie, Johnnie, not William, Charles and John which is interesting. He came to London, I don’t know how, and worked his way up to be foreman of a hop warehouse on the Thames, these were big buildings with a – a rope and a winch at the top, barges came alongside and the huge hot bales were – were stacked up in there and these turn out to be – these hot bales turn out to be very useful in the – in the First World War because they used to stop the shrapnel from all the guns that went off to try and shoot down the Zeppelins that came across London at that time, so they used to make a sort of shelter of these great bales and the – and the bits of shrapnel stuck in that. So yeah, he – not much of – he played bowls, which is his great sport, kept little birds, wild birds in cages which upset my grandmother ‘cause she thought the poor little things used to be free. Used to take a trip down to the countryside just near Dorking up onto Ranmore Common which is there, catch up little birds, linnets in particular, and bring them home and they’d sing very happily. What else to be said about him … he was if anything a – a brutal man, by that I – I don’t mean he was necessarily cruel, he was just brutish in the way a farm labourer would be. My grandmother, who came from slightly better background of being a farmer’s daughter, did suffer for many many years with him, she – she was – she – no, she was Victorian and she was married to this man and that was it. And … when she was dying, she – she was in the hospital and … she’d got
cancer of the throat and she was dribbling all the time, which was very very sad, ‘cause she was a proud woman and so when she talked she dribbled and she had to dab it all the time, very sad, and she said, she said, ‘I’m so sad,’ ‘Why are you sad?’ she was – she said, ‘I did hope George would die before me and I’d have a few years of peace,’ now isn’t that sad, that really is sad. Anyway, George didn’t – George was also put into … council care and was sat in a chair with about thirty of them, all doped up to the eyeballs I suspect to keep them quiet, sad. Croydon this was.

_Hmmm. When abouts was this?_

When about?

_Yeah, just – just a rough idea of time._

1936 they died, yeah, about that, just before – just before the war …

_Did you visit them in the home or –_

Sorry?

_Did you visit them in the home or –_

Oh yes, yes I did. My mother did as well. Yes, it’s sad, it really was.

_How much influence did your grandparents have on you when you were growing up?_

Influence on me, overly practically none, I did go down to stay with them for weekends and they liked me – having me down there, they said, you know, ‘Can Raymond come and stay?’ ‘cause I was – I was believe it or not a very attractive little boy, and they used to have me there and my father used to – grandfather would take me up to the shops or wherever it happened to be, bowls or – as I say, occasionally to see Crystal Palace play, very structured formal life, nothing very – happened very much.
Hmmm.

Trying to think what else to say about them … I – my grandmother had – had a relation, and I can’t remember exactly what – what that relationship was, with a lady who married a man called J.C. Mandell, this is really going back to Victorian times now, and he was a head gardener, after a whole lot of promotions, at a very big country house called Moor Park which is now on the edge of Rickmansworth in wherever it is, edge of London, now a golf course but at that time it was the – I think the Ebury, E-b-u-r-y family and … he had a carriage and a house and sixteen gardeners under him, this sort of thing, and he was very strongly religious and part of the – of the religious community and a … obviously ran the gardens very very efficiently. And he kept a diary which I’ve got upstairs and – typical Victorian scrapbook with all sorts of rubbish in it, well not rubbish, bits of things, little sketches and bits cut out of newspapers and anything that interested him, and lots of these scraps were the Eburys had – all sorts of things went wrong with them, one of their sons committed suicide and that sort of thing, and so each of these funerals had to be – or wedding had to have flowers, and this was a terrific thing for him to do and all the lists of the things, how many and who carried them and what – were all there, kind of a military operation, that was interesting. J. C. Mandell, and he carved his name on everything, I’ve got lots of things round this house here and there with J.C. Mandell on it [laughs]. Then they retired to the Isle of Wight, Ryde, Isle of Wight where my mother used to go and visit them as a little girl.

[44:18]

You mentioned holidays a little while ago, while we’re on the subject of visiting people.

Yeah.

Where – where did you go in the caravan?

With my parents?
Hmmm.

The – the one holiday I can remember [laughs] because it was catastrophic, was the Lake District. My father had had a friend, man I – we used to call Uncle Billy, he wasn’t actually an uncle, but he was a bit of an engineer too and they were designing – ‘cause you didn’t buy these things in those days, the tackle that joined the caravan to the car, this was a sort of ball and socket joint and a lever like this [demonstrates] and it had an impulse brake, so that when you put the brake on on the car, the caravan run forward onto the car and put its own brake on. And then there’s the tow – the actual bar that held this on and Uncle Billy said, ‘That should be three quarters of an inch,’ and my father said, ‘No, half an inch will do,’ so half an inch it was. So this was built in half an inch, and we were on this holiday fairly late at night on a Sunday going through Tamworth which is a midland town, midland northern town, and in the middle of Tamworth, the road goes whoosh down like that and up the other side and we were all sitting in the car and down the hill we go and up the other side and of course when the – the car and the – the caravan is pushing the car down the hill and when it starts to pull there’s a bit of a jerk, well there’s the usual jerk and up we went up the hill and my father says, ‘The engine’s running very well,’ and my mother says, ‘Yes, ‘cause we just lost the caravan,’ [both laugh], so the caravan stopped and slid gently back into one of these electricity boxes on the side of the road for wiring, nobody hurt, no problem at all, not much damage to the caravan. Sunday night, nobody about, absolutely nobody, so we backed the car down and Mummy and I were told to stay with the caravan and he’d go and liaise with the police, so he went away with the police and the time went on and on and on and we were getting so fed up, and eventually she sent me – I was what, seven or eight or so, off to find my dad, so I found the police station and there was the dad having a nice scotch with the – with the commandant who happened to be an old school friend, so [both laugh] anyway my – whisked him out of there and we had the car and this thing towed round to a big transport yard with rows and rows and rows and rows of lorries and we parked up in the corner and we slept very happily and there’s no problem, and there, next morning they welded it all up and off we went again. And there was only a dent in the back of the caravan, so that was enough peef [ph]what was called – like three-ply was in those days, then we went up to the Lake District and there again you would knock on the farmer’s door, ‘Can we park in your – your field?’ ‘Yes, no problem,’ and in some
cases he’d come and, you know, tow you across and put – lovely, so we had some beautiful holidays there on the edge of the lakes, where now it would be quite impossible and there would be fences round it and big caravans parks and so on. But there was no – because people didn’t have caravans in those days to that extent, there were must less caravans on the road and people using them.

*And you and your father built the caravan from scratch then or –*

Oh yes, absolutely from scratch, yeah, absolutely. Lovely lovely lovely birch … bend wood which was steamed to make the curve on the back and a canvas roof and inside two beds, a kitchen in the front and lovely – and little loo, yes, excellent, beautiful. And I slept in a little tent outside, that was good, that was lovely. No, the caravan was a great success.

*And unusual you said at the time or …*

Yes, there were caravans and you went to caravan parks where there was a few caravans, but there weren’t acres and acres and acres and acres of – of static caravans, nor did you follow queues of caravans on the road, no, no much less, much less.

*Do you think you travelled more or less than people you were in school with?*

Which school? My first school yes much more, before I became eleven when I was at council school, Purley Church of England School. But once I got to Caterham School no because the people I suppose were richer and more upper class than I was, not too – not too much so but I didn’t – never had any trouble at school after the first sort of, you know, as I say, the first battles to find your position, no problem at all.

[49:00]

*You mentioned class again there, I was wondering how – how aware were you of that when you were growing up?*

What time were you going to leave?
Half five wasn’t it?

Right, well we better get think about – so ask that question again. Sorry, where are you going up –

Just back to class actually, just where it popped up then, I was just – how aware were you of it?

Of class?

Hmmm.

The village had no lord of the manor or upper class people at all, didn’t come in very much there, I wouldn’t say class came into my upbringing very much at all, no, we just were where we were and that was it. No, not really. Right.

Shall I pause it then?

[End of Track 2]
Track 3

As we go along [laughs] –

Okay, now the questions.

_Hmmm … well it’s an interview with Raymond Bird on February 22\textsuperscript{nd} 2010. Ray, when we were talking last time I think we covered a lot of your childhood and the – well having a career overview, but I had a few sort of specific questions which occurred to me later about your childhood._

Okay.

_You talked a lot about how you had quite a sort of practical outside childhood._

That’s right, I was free to roam in the country with parents who’d let me get on with it, in fact encouraged me to get on with it, yes.

_What toys did you have was my next question actually._

Oh I made toys, well I had toys, I – Meccano, very strong – Hornby very strong in my life – my childhood, big Meccano set, built mock bridges and things that chunted around and that sort of thing. The Hornby and the Meccano went well together because the trains chugged round and you can make things out of Meccano that went with – with the trains, like bridges and platforms and so forth. So yes, so I had a lot of help there. Then I moved onto model aeroplanes, balsa model aeroplanes with elastic inside them and propellers at the end [laughs] strangely enough. And so I – I had a – a bedroom upstairs where – which was mine and I could do all this sort of thing in. So yes, I think that’s true. And then I was always making things so trolleys were very very strong in my life, if you’re a kid in the country trolleys are very – well all sorts of multipurpose uses, but mainly sliding down hills and falling off and getting muddy. So – but trolleys are made out of old prams and where do you get old prams, from dumps, so one of the places that children would go is to raid the local dump looking for wheels and then the – to one’s parents’ horror these wrecks were
brought home and – and demolished and screwed onto wooden frames and made into trolleys, for, well carting wood around, sliding down hills on, oh all sorts of things, yeah.

[02:13]

And you mentioned last time as well your father was quite practical and hands-on.

Oh he was a very practical man, he’d been an apprentice carpenter in the building trade when he started life and he went on to be a quantity surveyor which is – I don’t hear much about them nowadays, but a quantity surveyor complements an architect, an architect does the plans for what he wants to do and the quantity surveyor takes those plans, measures them up and decides what quantities are necessary for what and what type of thing, paint, cement, flooring, lighting, everything, and a list of materials is then made out for a – for a thing and then the other thing the quantity surveyor he – what’s called extends those and puts a price against each, so he has a whole lot of catalogues and things like that, and out of the end comes the price. Now a quantity surveyor may work for the architect, or he may work independently for a building firm who wants to put a quote in for the price, so that’s what my father did, so he was a very practical man.

You mentioned he used to build radios, I wondered if this was –

Absolutely.

So you’d helped him in a sort of –

Let’s think. No, not initially, no, he built the radios quite separately. But when I went to the university, then I started being interested in making my own radios and then he helped me on that, yes, but it was just after the crystal set era if you under – do you remember what a crystal set was, you moved – you had this extraordinary crystal on a little piece of wire, and you fiddled this around on the wire until it acted as a … rectifier that enabled the modulated signal that is coming through the air and being received by the tuned circuit to be received and produce an audio frequency wave
which you can hear, so that was the old – and no batteries in the old crystal set, so anyway very crude but it worked.

So did you have one yourself then or –

Oh yes, yes. I think all – most people messed about with crystal sets. Then valves came along of course and then you had to have two batteries for the valves, one for the HT and one for the filament inside the valve, and then the crystal became, the crystals become obsolete then, yes.

Hmmm.

And then a whole number of series of inventions were taking place in how to – to build radio sets … one of these was the development of what’s called the Intermediate Frequency Strip, this – instead of just amplifying the signal as it came in, which might be quite a high frequency and difficult to do, the intermediate frequency meant you changed the frequency of the things coming in to a lower frequency, into an already tuned, that’s the vital thing, intermediate frequency strip, two or three valves with tune circuits between, and that was a great invention. And then also something called Negative Feedback which is very vital, it’s all over your body and everything else. This is the principle where you take some of the output of something and feed it back to the input reversed, you think, well that’ll stop it [laughs], not quite [laughs]. If you take – if you set up such a circuit then – and you feed back say 100\textsuperscript{th} of what went in then, the gain settles down to 100, whatever is happening, it’s a very powerful principle. And the human body has negative feed backs all over the way, mostly connected with hormones.

Diabetes for instance [laughs] I suppose.

Yeah, probably yeah. Anyway, yes, so yes I was deeply involved in that sort of – and … I also had a little – ah, next thing, my mother I think I mentioned was a great one for going to auction sales and she used to – if she … I say on a whim, that is putting it too – if she saw something she thought that it would attract me, for instance my Meccano kit came in a big wooden box with a nice hinged lid which it was
somebody’s cast off Meccano kit, so she was a very sensible woman and she – her view was, never ever buy anything new if you could get it second-hand, for two reasons, one it’s cheaper and two you can see what the hell time does to it. So yes.

_Hmmm._

So she bought a – a little toy steam engine with a little burner that you put in and it was a boiler, you know, and a wheel and it went chug-chug-chug-chug and puffed steam and that was grand, yeah. So yes, I had a – a very open supportive and – ah, yes I think the reason was – is I – I think I was born with it, I was a self-starter. Do you know what the phrase self-starter means, it is – it – you don’t have to be pushed into doing something, you think in your brain, I want to do that, and I’m still a self-starter, I’m exploring, just been on a long trip to China where I was a self-starter and planned all the trip, and before that the desert I did a whole trip which I planned myself, so I’m a self-starter in that way, and I think if you link that to the inventive ability, those two properties … complement each other, no use being an inventor if you don’t get stimulated to invent, and if you’re a self-starter you are stimulated to invent ‘cause you think, well can’t – couldn’t we do something about that, it’s a self-starter, you do think, ooh jolly good, I – I – perhaps if we do this it’ll work so, you know, yeah.

_Hmmm._

Okay.

[08:17]

_I was wondering specifically as well, when did you first encounter electronics?_

Electronics … not really till I went to university. I went to university because I got a thing under – go and get a degree and we’ll give you a commission because we – we need signals officers, and it was called the Hankey Scheme and it worked well and it was a brilliant scheme. And so I went to taking electrical engineering degree, there weren’t at that time where I was electronic … engineering degrees, but the electrical
course covered some electronics, radio and all that sort of – transmission line theory and all that sort of thing, so yes, that’s where I started to mess around with valves and, yeah, yeah. But it was quite early days … not many people messed about. Ah, something else I ought to say, I had a cousin, a pseudo cousin, I called him a cousin, who was two years older than me and was right into early television and I used to visit him at his home where he was making the first amateur television sets by what was called the Baird principle. There were two principles, one which used the cathode ray tube which we use now, but before that John Logie Baird had the television apparatus which was much more mechanical and consists of a disk with a whole lot of mirrors tilted at various angles that scanned, as you can imagine, like this as it went round and so forth and so he built this television set and – and received these first transmissions from Alexandra Palace, 1938 I suppose that would be, somewhere around – maybe ’37 I don’t know.

*It’s around ’36, ’38 period I think.*

So that also left … impressions on me. But actually … really learning about electronics, that didn’t actually happen until I went to – to Woolwich Polytechnic, who had a brilliant, very good lecturer there who in – yes, introduced us to that sort of thing.

*I’d like to follow up the university part a little later on, just to put this in order as it were, but I’m –*

That’d be a good idea, yeah.

[10:44]

*But mechanical TVs, what did you think the prospects for television [laughs] would be at this time, it’s …*

Oh it was just a toy, the thought of everybody now looking at it for half their lives, not in – nowhere near in one’s brain. It was just a toy and rather interesting at that and – but, you know, it’d never ever get anywhere, much too expensive and crude, yes,
could never do that. So yeah. And all the way through my life and other people’s lives, I think this is the reaction to many great inventions that have got somewhere. The web is another example that at the time it came along when I thought, what the hell was all this, you know, it’s all right for the scientists and so forth.

*Did you – did you actually watch a mechanical TV yourself?*

I watches – I never watched it for pleasure, I watched it demonstrated by him with this sort of grainy flashing light of – you could just make out human beings there, and yes. Yes, but yeah. I often wonder what happened to him, his name was Thumbwood and quite a bright boy, he became a lecturer somewhere, doing something.

*Hmmm.*

[11:59].

*Keeping up this childhood theme, you mentioned last time something I was intrigued by, which was a trip to the Science Museum as a child [laughs].*

Right, as a boy.

*Yes, yeah.*

The Science Museum, South Kensington, that was again my mother’s … she tried – she also was a self-starter and she taught herself French and she was always listening to the French, I think I mentioned this, at home, so – and she was in – into – into art and going to art galleries and that sort of thing and took me to art galleries and that sort of thing, so I – and as I think I mentioned, she also made sure I got magazines which she bought cheaply from Croydon Library. So, you asked a question?

*I was wondering what your memory of the Science Museum was?*

What the memory of the Science –
What was – what was your impression of it?

What the memories, going there into this huge hall, then Foucault’s Pendulum was on the left hand side which I think they – they brunt the little string about every hour, and then there were these lovely galleries full of machines where you pressed the button and they moved, mostly models of steam engines and that sort of things. But … practically no electronics, electrical things, so almost all models of steam engines and that sort of things. Working models I’m talking about, yes, there were models of aeroplanes and ships and that sort of thing, but they were purely models, they didn’t go round and going round was the vital thing for somebody like me, yes, otherwise a little bit boring, yes, that’s another aeroplane and so forth, yeah.

So your favourite bits were the hands-on parts that actually did something?

Oh absolutely, and I think that’s true of most children. Does it move, you know.

Hmmm.

[13:48]

What – do you remember what you actually thought about science and technology when you were growing up?

Oh god, that’s a – a question –

It’s a big question –

That’s two levels higher than a – a child’s …

Let me – let me break that one down a little bit then.

Please, yes.
Maybe do it a bit more specifically. Were there any technologies that really fascinated you as a child?

Well I’ve – I’ve talked about flying – making flying aeroplanes and trains running round on tracks which you wound up, they were – they were mechanical, not electrical Hornby by the way, that was too expensive. And Meccano, making things, yes, so yeah.

So it’s this practical aspect again isn’t it?

Yeah.

You mentioned as well you read Scientific American ‘cause your mother – I was wondering what else you used to read?

Ah, good question. There was also issued on a weekly basis a magazine that … I think might have been called The World of Wonder but that’s a sheer guess, it was that – that sort of title, and it – it was not an Arthur Mee, I’ll come back to Arthur Mee, it was a publication issued where children … and I suppose adults as well to a certain extent, were introduced to all sorts of aspects of science and the world and I remember – I – every week waiting for this and I bound them up, and I’ve got them somewhere, fifty-two copies of this thing, and I used to bind things myself you see, very crudely. The … magazine took aspects, and I remember one, atoms was starting to be split and that – the fact that there were electrons and neutrons and protons making up the centre of an atom and that these atoms were elements and there was a table of these elements with various properties, the periodic table, that was all coming out at that time and this World of Wonder took various aspects of that, and I remember one thing which showed a lump of coal and saying that the – if this lump of coal was split right down to its atoms and the energy stored in it, it’d be enough to drive the whole world, you know, the – the difference between chemical power, due to oxidising carbon and getting the – and the power locked in the atom itself which is now, you know, atomic energy, was vastly greater. I can’t remember whether there
was any mention of the possibility of making a bomb at that time. Anyway, so that – that was that, yes. So very interesting magazine and very stimulating indeed, yes.

[17:06]

Hmmm. Speaking of science and education as well, I was wondering about science at school, you mentioned it was one of your favourite subjects …

Right, yeah, again I – I – as I said, I got a scholarship to a school called Caterham School in Surrey and the science lab was very good at that, they’d had a number of rich old boys who contributed to building this new science block and the – the names of the laboratories – sorry, the classrooms in this big building had the names of the donors, so there was Carmichael, there was Young and so forth, Young One, Young Two ‘cause he put in more money than Mr Carmichael, but anyway [laughs]. So yes the school was right into science and the chemistry master and the – the physics master were – were very supportive and very good and, yes, a lot of drive.

So was it just chemistry and physics you did, no biology or –

Oh yes, biology because people wanted to be doctors, that was the reason why the school did biology, ‘cause that was a vital – a must for a doctor. The biology didn’t interest me so much, yes it was mildly interesting but it didn’t interest me so much. I loved the chemistry and the physics, the maths I sort of supported and as for English, French and German you can forget them, you know, they –

[laughs].

But I had to do them obviously.

Yes, do you mind if I just put that door shut a sec, just because the –

Do what?

Can I just push that door shut a sec, because of the –
Right, let me do it.

*Right, I'll just pause that a second. [Break in recording]. Going again … hmmm, do you remember anything of how the sciences were taught when you were at school?*

I … difficult ‘cause I’ve got nothing to compare it against. To say whether it’s like it’s done now or was done before, I’ve got no standard of comparison, but it was well taught, it was always aimed at a curriculum for passing an exam, the science – if the science master wanted to teach you something outside the normal curriculum in order to get through general schools or higher school as it was – they were called then, then he would probably say, ‘I’m taking you to show you this at the moment, or that at the moment, but it’s – you don’t need to know it for your exams.’

*Did that happen a lot?*

Oh yeah, and very sensibly so. I think the present trendy education to try and develop people’s minds by immersing them into – what do you call it, an environment without it structured towards an exam is stupid and doomed to failure and it is a bloody sociologist con. Okay, next.

*What were science classes like, as a follow-up?*

Very good indeed.

*What would happen in science class then?*

Oh well it depends what you’re doing, let’s – if it was a class on, say physics, we might be all sitting in benches and then some demonstration would almost always be, ‘cause nothing grabs children like a demonstration, in … magnetism for instance, magnets would be produced and show how they repel and make things go round using magnets and that sort of thing. Yeah, theories of magnetism, very good. But in chemistry, yes, things – if things could be made to go bang that was – definitely got the – the child’s attention. And also things like taking a piece of … I think I mean
phosphorous and dropping it into water and showing it fizzing away and that sort of thing, yes, very much so. And sodium, that’s what I really meant, so sodium metal and sodium was as metal ‘cause you cut it and it was shiny, you can’t make anything of it but it – it definitely was a metal. Anyway, yeah.

*It sounds like you had very supportive teachers, you –*

Very, yes, very lucky. And the war was on and they also helped towards the war effort in training children like myself to support the war effort by teaching us how to drive tractors, I never actually unfortunately had the chance of driving a tractor for real, but – well I did but I mean not – not in … round fields. Oh yes I did, because later on in the war there was a wheat field at the back of our house which was being harvested and I was allowed to drive the tractor carrying that sort of thing, yes, so it did – did have a – Mr Fordson’s tractor, Mr Fordson’s tractor.

*Hmmmm. How well did you do at school, if you don’t mind me asking [laughs]?*

No, not at all, I did very well at school … and or but, I don’t know which to use, I was in a – a – *annus mirabilis* as the teachers called it, where there were the very bright boys at the top of the class and I was third or fourth in the form, so I’d always got people that were brighter than me, and they were bloody bright, so I was very very lucky, I had this stimulus of bright pupils above me, yes. But unfortunately my generation suffered because of the war; most people kept contacts with their school friends, more importantly than the university friends, they – many of their friends in life came from their schooldays, but the war finished all that ‘cause we all went in entirely different directions and never caught up again or – I could have done because there was an Old Boys Association and you got the magazine and that sort of thing, but no I – in fact it may be my – my mind as well, because I’m not a joiner in that respect, I don’t join societies and clubs and that sort of thing. Not for the human content, for the intellectual content, yes.

*So you finished school in 1941?*
… I should – just about then, well done, what a memory you’ve got. Yes, 1941, the air – the Battle of Britain had just taken place and we were harvesting the fields and all these aeroplanes were zooming around and crashing and things, yes. And we lived near Kenley – Kenley Aerodrome in Surrey. Which incidentally I visited again and it’s … it’s mostly housing estates now and a few notices stuck up saying what happened there in the war, but no, the atmosphere’s entirely gone, with the little aeroplanes all out on the grass field, and the German aeroplanes coming up and dropping bombs and killing some WAAF’s, no, it’s quite different.

[24:27]

Could you describe the atmosphere for me?

What, in the war?

Yeah. It sounds like quite –

Well don’t forget a – a child growing up into war has never known anything else; it was not – what’s the word I want? Yes, of course it was a great change from what had happened earlier, but that was my life and that’s how the world was … lived in a village, cycled to school about three or four miles … heavy – rationing was very strict and we all had coupons of course, which parents looked after. But the rationing was superb, we never really went hungry, we may have had food we didn’t really like but there was – there was always enough, a – a great compliment to Lord Woolton I think, the man that dealt with most of the rationing, very much. And of course it applied to furniture and all other things. In fact I’ve got a bed upstairs that has got these mystic numbers, I think it is CC41, utility furniture had this symbol on, CC41, it’s still a good bed. So coming back to the war, how it affected me … was I frightened in the war? And I’m not talking about my fighting part of the war, I’m talking about when I’m a child, up to ’41. Was I frightened? Yes, I was frightened when the air raids were bombing London ‘cause you could hear these single aeroplanes buzzing across here and flashes over there and you think, well suppose it dropped on me, and somehow you feel very vulnerable. The fact that you’re in the middle of this vast expanse of nothing in the countryside with just fields and what have you, but you feel
that choke [ph] could see you and he’ll drop on you. And then as I say at the bottom of my road there was a dirty great searchlight, searchlight camp near Chaldon Church and the light from that was horrendous, it would light up the whole area … huge light. My – I was – that was a little bit after I left home, my bedroom was then given over, compulsory, by billeting, so we had a – a soldier who worked on the … the – the lights, the – the huge searchlight, billeted in – in my parents’ house, yes. My father worked for – who as I say was a quantity surveyor, he was drafted or got a job at the Admiralty at Bath, so moved away from home, so my family was split up then, my mother was here and my father was down there, and I was at … Woolwich Polytechnic so my father was an – was alone during that – that period. She became a VAD, Voluntary Aid Detachment which is part of the – I think I may have mentioned this, part of the Red Cross and had a white hat with a red cross on it, petrol allowance very important so she could go there and she was the – I suppose day staff, they had a rota where there was always one nurse on duty, in case there was an air raid or something like that.

So your mother –

Air raid – of course there were air raids sirens everywhere that went off now and again, yes.

So your mother actually worked in a hospital on a regular basis then, it wasn’t just –

It wasn’t a hospital, no, no, it was just an office … yes, I – office is one way – a depot, depot, a depot where they had stretchers and some medicines and that sort of thing, yes, and their job was to rush out if there was a bomb dropped to provide immediate help for the people that were stricken there before the main ambulances got there and the big machinery came into it, if the ambulance ever came of course. So they learnt about bandaging and that sort of thing, comforting people and stretchers and that sort of thing, yeah, and lots of practices of lowering people out of windows and so forth, yeah. So yeah.

So your mother actually got to do this – did she actually go to bomb sites and rescue people then or –
Very little, because luckily, though Caterham did get the odd bomb, it – no, I cannot remember her actually having to go to a site in anger, other people did but for some reason for her she didn’t, so that was that.

[29:13]

_So how much contact did you have with your parents when they were in these different places?_

While I was at school, up till ’41 I went home every night and I was a – a day boy, cycled home, so I had normal childhood. Then I was … not called up, I was – went on this Hankey Scheme to Woolwich Polytechnic and then I would come home every two or three weeks by bus, a long bus journey from Woolwich across to – to Caterham, mainly to get my washing done, which wasn’t necessarily what motivated my mother but she – she liked to see me then, but my father wasn’t there some of that time when I was there. So yes, my – the home split, but then the home would have split anyway if a bloke goes to university, so you can’t blame that on the war.

[30:12]

_So how did you make the transition then from finishing to school to being at university?_

With no problem whatsoever.

_Laughs._

You just go to this other place that you think is another school and it turns out to be very much like a school except you’re – you are – like most universities it’s your job to get on with it and do the work, you wouldn’t be bullied into it as you would be at school, no difference.

_So what’s the process then – so you finished school in ’41?_
Yeah.

Did you just decide to go to university?

No, no, as I say … I had at school belonged to the Air Training Corp and I expected to be called up into the RAF, and I … wanted to be a pilot, however my glasses wouldn’t allow me to – spectacles wouldn’t allow me but I could be a navigator, but I also wanted to go to university, and then the Hankey Scheme came along and … touts came round from the government trying to look for boys that would like to go onto the Hankey Scheme and I was interviewed and that’s how I got, yeah.

So the government actually sent people round to the schools on –

Yeah, yeah.

Hmmm.

Well yes, of course, I mean yeah.

So did you have a lecture or an interview or a talk or … or how are you introduced to the Scheme?

I cannot remember, I cannot remember.

Right.

I think the selection would have been done on the exams I was already taking, on my higher school exams which I got [laughs] … four As in … physics, chemistry, biology and mathematics and three Cs in English, French and German [both laugh] which I think must say quite a lot about my one sided brain.

[Laughs]. What – why did you want to go to university?
To get a degree, I always wanted to get a degree, I wanted to go on. Somewhere in the back of my head I wanted to do research, whatever that was, but do research is what I wanted to do. Again, I think this is entirely consistent with my … hands-on inventive making things happen sort of mind, yeah.

_Hmmm … so you went to the university, how did you decide which subject to do?_

That was decided for me, the – they were after signals officers so if you wanted electronic signals officers then you jolly well took the course that – which was an electrical engineering degree with some emphasis on electronics. But at Woolwich Polytechnic it was on the whole the straightforward London University electrical engineering degree, which would have all sorts of curious subjects in there which … there was the first year and the second year, and my brain I don’t think will be able to decide what was the difference between the two years, but we did subjects like strength of materials, which was stretching things and seeing them go bang, theory of structures, which was stresses in beams and that sort of thing, electrical machinery, very important. The college, Woolwich Polytechnic had a very well equipped electrical machine laboratory – lab, where there were all sorts of dynamos and transformers and motors which were hands-on things and they worked, and that was very well run in a most methodical way by the lecturers, and then there was electronics, valves, I don’t know if it was called electronics, anyway, that sort of thing, valves, where we learnt a bit about radios and that sort of thing, but that was not as well structured and the poor lecturer had to in effect invent the course himself and we were short on that side of … vital equipment to run an electrical lab, sorry an electronics labs. I remember we actually got a valve tester, there was a company called Avo that made – I don’t think it still exists but they made a valve tester where you plugged the valves in and you could test them, which was – and also we had Avo meters which were multi – multi-meters, I mean it sounds so pathetic nowadays that we were glad to see these things, but we were. And then there was the Cossor Oscilloscope which was another vital piece of equipment, the introduction to the oscilloscope I think was, looking back, the one groundbreaking technical instrument, because you could see waveforms and if you could see waveforms and time on the screen – you know what an oscilloscope is, you know, a scan goes across left to right at a certain speed which you can adjust and then the – the voltage deflects the – the
wave up and down according to what you’re displaying, so it’s stretched out in time. And this visual ability to see a waveform was groundbreaking compared with just having a meter that would just say seventeen, or twelve, you couldn’t know really what the waveform was like, was it a – a saw tooth or was it a – a sine wave or, you know – and that property linked very strongly into … digital electronics, in the war lots of things went from analogue to digital; are you familiar with what I’m saying? Okay, analogue is the – the height of things, a digital thing is it’s there or it’s not there, it’s a one or a nought, and that was the basis for much of radar of course and signalling, so digital electronics came in in a big way. And companies like – no, I’m – if I talk about this I’m talking about things that I didn’t know at the time, so I won’t – going to say that, I didn’t know many of this still after the war. At the end of the war the IEE, which I was a member of, did a groundbreaking series of presentations, lectures, on all the things that had been secret in the war and that was again a very emotive thing for me to – these radar things that I didn’t know about, because I was a signals officer, I wasn’t a radar officer, quite separate, and things like Oboe, GEE, H2S, all these different sorts of radar sets that were used principally for navigation and – and bombing and marvellous pieces of things they were too. Out of interest … I was reading only the other day that the evidence has come to light that the Germans had also invented radar and if anything was slightly ahead of us, which is extraordinary because we always thought that we were the people that invented – Watson Watt and … what’s the name of the damn place up in … Suffolk where there was –

Malvern?

Eh?

Malvern or Bawdsey?

No, Bawdsey, Bawdsey Manor and north of Bawdsey Manor where even before Bawdsey Manor there was a great strip of – of sand where the original testing was done, oh why can’t I remember what it is called, anyway there we are, doesn’t matter. So I’m sorry in a way that I didn’t – it – get into radar, it was not presented to me as a possibility, ‘You’re going to be a signals officer,’ you know, it was no – what could I
do this, the one thing about the armed forces is they just say, ‘You’ll do this,’ whether you’re a square peg in a round hole is hard luck. And they discourage – in the forces, and I’m sure they still do, very strongly discourage people ringing up the posting people and saying, ‘Look, I’ve got this property, can I please go and do this?’ if I’d have rung somebody up and said, ‘I’m an inventive chap and I ought to be at Malvern,’ you know, I’d got into real trouble I would have done. But I hadn’t got the subtlety to find a way round that by finding friends in – in high places who would get me posted, which is the real way to do it.

_Hmmm. You’ve brought up loads of things there [laughs] I was going to ask questions about actually._

[39:29]

_The Cossor Oscilloscope._

A Cossor Oscilloscope, yes, I’ve gone one in the – in the shed incidentally [both laugh], anyway, it was a blue box like that with a circular thing on the front.

_How do you use one?_

How do you use a Cossor Oscilloscope?

_How – yeah, how – how would you – could you explain how you’d use one to someone who hasn’t got that much electronics knowledge [laughs], I’ll put it another way._

Yeah, surely.

_Thanks._

The Cossor Oscilloscope had – was not just one beam, it had two beams, it was called a Split Beam Oscilloscope, which meant you could display two waveforms at the same time, now that is vital because supposing you want to know – there is a pulse coming in or something happens at the same time as is another waveform you want to
know at what time that second event came and interrupted the first event. For instance if you’re looking at a switch and when it works, then you would look at the output of the switch where you’d see it and it would stop, and then you would look at the voltage that actuated that switch, if you wanted to and by go [ph], you know, when – when the switch – voltage actuated then the waveforms stopped or started, whatever it happened to be. The oscilloscope was – also had what’s – a variable speed time base, it’s how quickly the spot went across and you click-click-click-click up to probably a microsecond across the screen from – from a second across the screen, a great range of that, amplified – oh yes, the amplifiers inside the box because the voltages which you were looking at, you were looking at voltages, not currents, where you’ve got two clips, one across, whatever it is. The voltages would vary from micro volts up to many hundreds of volts, so again you had amplifier that amplified the waveform so that it fitted in the screen, it wasn’t too big off the screen, or too little you couldn’t see it, so that was that, so there’s a time base, speed across, there’s the amplifier that amplified what have you, also it had – what was it for, a gate a bit like that [demonstrates] – no you can’t – a bit like that, doesn’t get very well on audio [both laugh]. A time interval in the scan which you could select and then amplify it separately, so that if you had a scan going across and there was one little bit in that where you wanted to know exactly what was going on, but you couldn’t see it there and if you wound up the – the time base that thing disappeared off the end, so you wanted to look at that little bit. So the – if you put this gate over this bit, two little poles, there’s one there at the begin and end, and a delay in the – in the oscilloscope could enable you to look at that little bit, say five milliseconds after it started, twenty milliseconds after it started, so it’s a very very powerful tool for finding out what’s happening in electronic circuits, or not just electronic circuits, motor cars, anything, you know, very very useful, yeah.

So what would you actually use one for on a practical …?

Well it – difficult to say what you wouldn’t use it for. If you were say trying to test a – a radio set … rather than have a – and where’s the signal got to, there’s a little minute signal in at the beginning, big signal out of the other end, you would tap along the circuitry, across various resistors mainly to – where the waveform was to see what it looked like, so you could immediately define what the amplification was as you
went down this thing. You could – also radio sets suffered greatly from interference, lights or electrical contacts and you – with the waveform you could actually see this interference, so there would be this nice wave, smooth wave going across the screen with a sort of zigzag sparky bursts and also if those sparky bursts occurred at a regular interval, fifty cycles for instance, then by using the time base you could freeze the display so that you could examine what was happening, every fiftieth of a second, and if that was happening every – then you knew it was a – a mains interference, it wasn’t something separate like somebody running a drill somewhere or what have you, so very powerful tool indeed.

*It sounded like quite a – almost a revelation being presented with this thing –*

It is, yes.

*For the first time.*

Exactly. Very fair looking – once you found the cathode ray tube and what it could do with its display then the world was – you couldn’t do anything, it was – it was almost a – a must have. And cathode ray tube got more and more expensive and better developed with more and more properties, higher frequency and more – more amplification or whatever it happened to be, yeah. And portable, people went around with their – in the war people had their oscilloscopes, went to put it around wherever the trouble might be, took your oscilloscope with you, yeah.

*Hmm … I had a follow-up question but I’ve completely forgotten what it was [laughs].*

Doesn’t matter. Well the answer’s no, yes whatever [both laugh].

*What training did you – did you get on this thing?*

Which part of my career?

*The oscillo – when – when did you first encounter the oscilloscope?*
I was at Woolwich Polytechnic and the lecturer was introducing us to radio sets and how they worked and that sort of thing, yeah, so that’s where – where we were introduced to it.

_Do you remember seeing it for the first time or –_

Oh I couldn’t, no, couldn’t. I cannot remember that actual moment but it was, yes, as I say, it was a … a remarkable piece of apparatus.

[45:54]

_Why did you go to Woolwich in particular?_

Why did – Woolwich?

_Yes_.

I didn’t go to Woolwich, I was sent to Woolwich, this was a war. Would I have gone to Woolwich if I had my own choice, of course not, I’d have gone to Oxford to Cambridge, but that’s where I was sent, there we were, yeah.

_Sounded a moment ago –_

It did a good job by the way, I’m not grumbling.

[46:20]

_It sounded a moment ago like – you mentioned if you’d known about radar you could have wanted to do that instead of being signals officer._

I think.

_And I was just wondering –_
But let’s face it, I didn’t know about radar, nobody knew about radar, I didn’t know about radar in any detail till after the war it was so secret.

No. I was just actually wondering when you were at university was this career path from – to being a signals officers always the end point?

No, that was the war. After the war I wanted to do research and this is what I did.

No, I meant were you being directed down a specific career path by the war then?

Oh yes, to be a signals officers, that’s what they wanted me to be, which I was, and the job of being a signals officer is two – two sorts of signals officers really, well there’s the same bloke but he could be two sorts of jobs – one is looking after the aeroplanes and all the signals apparatus in the aeroplane, apart from the radar which was somebody else’s job, all – a number of different radio sets in aircraft that do various things and the ground stations that kept them fed, they were also the responsibility of the signals officer, yes. And the other sort of signals officer job was the … vast communications system that the RAF had all around the world, all over the world there were air force stations, right to Australia of course, and Canada and South Africa, Middle East and India, and they all had long distance radio sets which I was the signals officer of one of those, controlling these links which switched on and off at various times of the day according to where the heaviside layer is, there’s a layer of ionised air above the earth that determines whether a signal can get reflected off it and go around the curvature of the earth, and you change frequency in order to select the optimum frequency for that time of day, that – how much the sun was shining and ionising the air.

[48:29]

We’ll come back to this in a little bit, there’s a question forming in my mind but it’s not quite there yet [laughs].

Okay.
Back – back to Woolwich for a moment though, could you describe what the university was like?

Surely, it wasn’t a university.

Oh polytechnic, sorry, yeah.

It’s important, it was a polytechnic and therefore a bit down-market from being a university. The four polytechnics … I can’t remember the other three, anyway Woolwich was one of them, were part of London University and could award their own degrees. Woolwich Polytechnic was a Victorian institution connected with industry and the docks and the down part of the Thames, particularly companies like Standard Telephones and Cables, vast electronic – electrical companies down there, cable makers, Woolwich Arsenal itself and it – what’s the word I want, it was for training … operatives, and I’m trying to find the right word, for work in factories in various ways, technical training, that’s right, not airy-fairy degrees as you might go and take at Oxford or Cambridge. So thoroughly practical training and many of the students who went there came on sandwich courses whereby they got release from their – their apprenticeships in the big companies, take Standard Telephones and Cables as an example, they would work half the year at STC and half come to Woolwich Polytechnic for taking their degree, and of course because of this strong link with industry the Woolwich Polytechnic was able to send its pupils out to get practical experience in these firms and I was sent out to do that. Woolwich Polytechnic sent me for instance to Standard Telephones and Cables where there was a nice programme of you spent a fortnight in the capacitor making department and a fortnight in the cable department and another fortnight in the electronics and so on, so you got a very good practical training, first class. So Woolwich Polytechnic had been – was this large red brick Victorian building, three or four storeys high, classrooms, laboratories downstairs, great big machineries chundering around, been expanded a bit into courtyards to get more space, and then was bombed to hell in the war and – in 1940s almost certainly, and when I got there the – the front of the building was all covered in tarpaulins and great … area – number of classrooms were knocked out, but in the courtyard where had been a mechanical engineering workshop with lathes and
that sort of thing, which was vital to the sort of things that mechanical engineering – that Woolwich did, that had all been blown to bits and bits were reconstructed here and there of Nissen huts and that sort of thing, so – and as you went into the courtyard through a block of flats, through a tunnel, block of shops, two storeys shops, through a tunnel you came to this – what had been the entrance to this building which had been blasted to hell by the bombs, but these shops belonged to Woolwich Polytechnic and had been converted, the upstairs had been converted into a hostel where I and the other lads were put, were two or three to a bedroom where we had a little kitchen and doing our homework and that sort of thing, excellent, thoroughly – had a good time there, yeah. All pretty basic and fundamental, no frills or what I might call [adopts upper-class accent] aristocratic university sort of – nothing about that at all, just down to earth, thoroughly practical training, which is exactly what the armed forces wanted of course. That may be why we were sent there, coming to think of it, because the training in Oxford and Cambridge would not have been up to the same practical standard as Woolwich Polytechnic training would have been. They’re aimed at a quite different field of people. So anyway, jolly good Woolwich Polytechnic was.

*What was the atmosphere like there?*

What was the … no problem at all, the lecturers were very good and happy to teach us … but as I say it was a thoroughly practical down to earth, no frills, good uni – good library by the way, down to earth … training, yeah.

*Hmmmm.*

Ah, one other thing to be said was that because of its nature, it put much more emphasis on coursework than other universities did and more of the marks were allocated at – in the degree to the standard of your coursework, which was lots of reports on this that and the other, nicely bound with tabs down the edge and indexes and photographs and that sort of thing, the coursework was – had a high level of necessity of getting the degree, so, I don’t know, perhaps fifty percent was coursework. The reason for this being that in a way unlike the – the true universities like Oxford and Cambridge, writing reports was vital to your success in doing your job if you were an engineer, or whatever it was, yeah. Thoroughly practical.
So the assessment then was based on – largely on coursework, what did coursework consist of?

Well coursework consisted of writing reports on each section of whatever it was doing. If I you did an experiment on the low response of a – a motor, then you did a report on that, what the motor was, what its performance was, what your test was, how it was carried out, graphs showing the – the responses, tables, that sort – a typical piece of coursework, yeah.

Did you get to build things as well?

Did you get to build things? There really was not time in the course to build something, so the – what’s the word I want, the lecturers of – I’m thinking now particularly of the heavier machinery part, big dynamos and motors, had very cleverly organised that so that pupils could in a matter of hours assemble what it is they wanted, so in other words if the motor was there, all the terminals were brought out into a great row, they were colour coded, on the wall there were lots and lots of colour coded leads of different lengths, meters were also with big terminals on them, so that if you wanted to set something up you took the cables down, clink-clink-clink-clink and if you had these machines without them being prepared you couldn’t have done, hours you’d have been inside boxes and trying to find a place to put the wires on, no very well organised so a pupil could in a short time set up connecting machines together and controls and meters to do an experiment, very good.

Can you – can you recall what sort of experiments people did at all?

Well it depends what the – well in a coursework on electrical machines … if you wanted to know what power an electrical machine would give out, then you would have to have a load which the electrical output from say a generator was put into, which would be big resistors, but – which would get hot of course, glow, and you could have meters measuring the voltage and the current going to that, what was coming out, and then you’d have other meters measuring what went in, so you calculated the efficiency of how much of the input power actually got to the output, a
load test, and at various speeds, various voltages. If the voltage was low would it still work and so on, if it was – voltage was high would it trip the – the overload, yes it did, could, and so forth.

[Laughs] Hmm. Sounds from what you were saying for that – the course you did at Woolwich was quite broad based, you know, you had sort of elements of material engineering, structural engineering –

Mechanical – there was a bit of mechanical in there, yes.

Yeah, it sounds a very sort of broad based course and how –

It was a broad based course for a practical engineer going into either the mechanical or the electrical industry that it served.

Where did the electronics part of this fit into it –?

That was a bud on [by which the interviewee meant innovation] because they hadn’t done much electronics. Nobody had done much electronics, it wasn’t that Woolwich was behind the times, it was that there wasn’t an electronic engineering qualification degree as such, as far as I know at the time, so they would just bud on [by which interviewee meant modification] on the electrical engineering degree. So they’d – the – the particular lecturer who was responsible for the electronics had to invent his own course effectively, yeah. But if you ask me what the parts of that course were I can’t remember.

Hmmm.

I could have told you if all my coursework hadn’t been sunk. My [laughs] – I asked my father ‘cause I wanted to do some swatting when I was out in India, in the hot sticky boring middle of India, to send me out my coursework, ‘cause then I could go over that again and it would help me prepare to life after the war, but the ship got sunk so that was the end of that, so all my lovely coursework with all them beautiful graphs is down in the bottom of the ocean thanks to some U boat somewhere.
[Laughs] Oh dear. What did you gain from the sandwich placement, was another question I had?

What did I gain from the sandwich placement?

Yes, or was it called a sandwich placement at the time?

Well for what – there were two sorts of people on this course, there were the sandwich students who were the normal people that were sent there by their companies to take a sandwich course degree, who did half their time at university and half the time working, and there were us lucky buggers who were just sent there to take our degree and though we were put on the sandwich course when they went to work we – we were free. Not quite true because there was a training course, as I was saying, to putting us into the works which was better than they had, because we moved around from company to company, very good indeed.

Hmmm. What – what did you learn from it, do you remember?

From which?

From – from the latter one, being sent from company to company?

Oh well practical experience of seeing people, how the real world worked and having the mickey taken out of us and – by the practical chaps that were actually working there [adopts accent], ‘Oh the bloody – what do these lads coming in here for buggering us around,’ you know, you can imagine can’t you, yes. And we were sort of … curious beasts with corduroy trousers and drinking and that sort of thing, so yes, all – all – like most university lads, yes, settled down.

What was social life like then?

Social life, mostly drinking, though again not too much drinking ‘cause we hadn’t enough money, the trouble with the world today is that youngsters have got enough
money to paralyse themselves. No, if you – we went out drinking it would probably be once a week on a – usually on a Friday night, yes, yes, yes, yes. Lots of pubs, yes, very nice. A couple of girls on the course, nice lasses, yes, yes, good. The swimming bath next door which I used to go to regularly, yes, Woolwich swimming – Woolwich swimming – swimming, yeah.

_Hmmm, who were your friends at Woolwich?_

Ooh, almost always the – the lads on the course, yes. Got on with them well, but as I say there again the war just split us apart and I’ve had no contact with them since. I – the – ah … the course you could choose, this was a moment where you could make an actual choice, you could decide that if you wanted to go and get into the armed forces and take your commission early, you could leave at the end of the first year, I think they introduced this ‘cause they were so bloody short of people that they decided that they hadn’t got time for taking a two year degree, ‘cause I mean England was getting knocked to hell by the Germans and they were sitting over there on the edge of the channel, the war was very serious, so you had the choice if you – and usually the elder ones decided they would take their commission now, so they’d go into the army or the air force and they’d come back and visit us with all their lovely hats and gold braces and so forth. I remember one chap who was in … motor torpedo boats chairing – he’d left the course and he came back to see us in – with his lovely naval uniform, we were very jealous of this, and he had his lovely hat you see like this and he – he put the hat down on the table and I was looking at this and he said, ‘It’s not there,’ and I said, ‘What’s not there?’ and he said, ‘Well the verdigris corrosion that you get from salt water on the badge on your hat gives you a status of being a real sea mariner, unlike a nice new badge that you’ve just got from the outfitters,’ he said, ‘but you won’t find anything. I thought I’d got some real verdigris on there but it turned out to be a bit of seaweed,’ [both laugh]. But anyway, it was lovely seeing these chaps and they came back to talk to us and so forth, yes, but we were – we were jealous of them and they’d altered entirely and they – they’d grown up, they had – well obviously they’d – what was going to happen to me a year later, the bullying of being turned into an officer had already happened to them and not to me. Shall we go and have some food?
I have one final follow-up question if I may?

That’s all right.

Were these social visits or were they –

Eh?

The visits of people who’d already graduated, were they social visits or …?

Oh yes, they – they were not doing it ‘cause they were sent back to talk to us, no no no.

Oh I wondered.

No no no.

Okay.

No. That’s right, because not all of them came and they didn’t all come at the same time, but they did come back to see us, yes. I’m trying to think if anything would have triggered that – those return visits, I – I can’t think of any reason other than just a nice social thing to do.

[End of Track 3]
Track 4

*Good for both of us.*

Good good.

*Right, and that’s running. Now where were we? I think we were talking before, we were talking about your university days and I was wondering – first of all I was wondering how well did you do at university?*

Well I went three times of course, first of all Woolwich Polytechnic for my BSc, then Imperial College for my MSc and then Doc Booth Birkbeck for my PhD.

*So let’s keep this in chronology order then. How well did you do at Woolwich? How well did you do at Woolwich?*

Woolwich, who knows, I mean I got my degree. I can’t remember whether I got a class – I can’t remember it ever being put into a class, that’s interesting. You know, first, second, third, I can’t – just can’t remember whether there was any class on it, there must have been I suppose but I didn’t – I would … [laughs] it wasn’t my priority at the time, it was to get a degree and then get into the air force and, yeah, get on with the – the war.

*Hmmm. What were the most valuable things do you think you learnt at university?*

Which one?

*Sorry [laughs], I keep saying that, at Woolwich?*

… Well the first thing must obviously be the content else I wouldn’t have got the degree … oh, I – obviously human training, being away from home, being amongst a group of the lads, learning to be social and live with them and discipline of doing the work myself rather than being bullied into it by somebody else, yeah, yeah, general human evolution.
Hmmm, so mentioned before that you’d never been much of a joiner of societies, were you member of any at Woolwich?

No.

[Laughs]. So what was – what was life like at Woolwich, what was it –

No, let’s be fair, there weren’t much social life at Woolwich except the lads having a drink together and living together, ‘cause we lived in this hostel. We were fed well, yeah … amusement, there was a swimming pool next door, there was two full sized billiard tables down in the basement which we could use, and of course we were the only people there except for the night watchman after five or six in the evening, so we had the place to ourselves so we could – went down there and played billiards for – or snooker usually, for – for hours, was lovely, that was good.

Hmmm, was the workload particularly heavy?

Hmmm?

Was the workload particularly heavy?

… No, it was just about right, no just about right, yes, yes. No problem. But that meant of course that in the evenings one had all the coursework to do and get the – these damn things written up and copied and pretty – they liked pretty pretty’s, you know, lots of colour and graphs and that sort of thing, yeah.

Hmmm, so you finished at Woolwich in 1943?

Say, yes.

[03:23]

And what was the process by which you went from Woolwich to joining the air force?
… I cannot remember the length of time between finishing my degree and joining the air force. I should think it must have been two or three months because when I was called up … for the air force I went into the air force obviously as a – as an erk an AC2, the lowest of the low, so I was recruited through … vast camp – at the vast aircraft – sorry balloon hanger Cardington, a place called Cardington on the outskirts of Bedford where you came and you arrived by train and you were told to bring a little suitcase and you put all your civilian clothes in it and wrapped it up in string and posted it home, and then you changed into your – your RAF blues and so forth and were put in a great big hut, hadn’t seen these guys before by the way, perhaps one or two but they were all – but they were all university chaps, they were all coming into this stream that was going to be officers, and we created quite a – a – a sensation because when breakfast was due and nobody came to take us to the thing we decided that – we elected one bloke to march us down there and the rest we marched all the way down there and dismissed and went in and had our breakfast and they said, ‘What the bloody hell are you doing?’ you know [both laugh], but they said, you know, ‘Well you didn’t come get us’ ‘Nothing to do with you lads, you’re in the air force now, you shouldn’t have done it, but it was a good idea,’ they were – they were mixed, you know, it moves about [ph] so anyway we got in there and that was only a – a short course, week, ten days learning how to salute, that sort of thing, and not to leave your irons behind. Your irons are your knife fork and spoon, when you – you get up off the table like here or at a restaurant you leave your irons on the table, in the air force the irons are yours, they’re issued to you, they’re your irons, so if you get up from the table and go out of the door, they’re gone, you never see those irons again, so you then have to go and see the fixer, the lad that can always fix something for you, which costs you money of course, and you get your irons back. Which is a good lesson well learned.

*Did it happen to you or –?*

Oh yeah, happened to almost everybody. ‘Cause you see you are so used to leaving your irons on the table, so really it’s only if you’ve got a pal who – and you’re looking after each other that you stop doing these things and the – all sorts of other little things that becoming a regulated airman without a mind of your own you have to
learn, you must not do anything other than you have been ordered to do, you must not use yourself – what do you call it, not self – will – self – self-propelled, your initiative. Anyway, so that was that. Then having got our uniforms and that sort of thing, we then – all of us posted up to the RAF … officers training establishment at Cosford, which is still a huge RAF base, or was, I don’t know if the RAF are still there but it’s a museum now and people learn to – to swim there or something. And … Cosford was … set up for training officers, great big barrack blocks with about forty beds in a room … superannuated officers giving the lecturers, big bar … so one goes through that learning all the things an officer needs to know and many they don’t like a lot of them – sorry, a small proportion of the instruction was how to behave as an officer in peace time, which was much more formal as you could imagine. One thing when you went to an RAF officers station as an officer you had to join – go to the home of the commanding officer and leave your card, you had a nice little printed card and you left it on the train and that showed you were around and that you would probably be asked for tea or something, but all that had disappeared, but we still learnt this is what you’re supposed to do. And of course we didn’t have the really smart mess dress that in peace time you had, we just had our normal blues with shiny buttons and a – what’s it called now, a very rough blue … not dungarees, almost dungarees … something jacket, suit, I can’t remember the – the term for it, but where there was no – I don’t think there were any badges of rank, oh there are – there are straps on there but – but nothing much else, a very simple working blue dress, I don’t know, battle dress, battle dress, thank you, took a long time to get there. Right, so having got through that I was [laughs], yes – one – you learnt to fire guns and things there and – and – and that sort of thing and one of the training exercises was there was a big valley possibly half a mile wide with a little stream wandering up the bottom and a great big grassy slope down and up the other side there were guns supposedly firing at you, and you had to rush down this slope, through the river with your gun held up like this so it didn’t get wet, and up the other side. A great row of us did this [shouting] ra-ra-rah, running down this, into this river and they all got across except me and I just disappeared, they’d been using this river for throwing mills bombs in and they’d made pits in the bottom of the river, so I disappeared, glug-glug-glug with gun and everything else and came outside and everybody roaring with laughter, except of course the – the sergeant major who – flying officer – sorry, warrant officer he was, he took the hell out of me, you know, I mean was tongue in cheek but
nevertheless quite serious about it. So I went on with the exercise, but when I got back I’d got pneumonia, so I had a – a week sitting in a bed being doctored and so forth, while the rest of them got commissioned, so I was commissioned a week later than the rest of them, so that was that. Then you get posted to your first posting and you move around and that’s that, hmmm.

_So everybody in your – your year then, I’d say SAU, your class they were –_

In the RAF you mean?

Yes.

Not at Woolwich, not at Woolwich?

_No, yes, in the RAF was – was also destined for the same sort of technical job you were –_

Yes, yes, this was a technical training course, most of us went off then – whether with the same lot again or got split up, to Cranwell which is another huge RAF station where we went to the signal school, I’m trying to think of its number, doesn’t matter anyway on – on – I was on OWC23, Officers War Course number twenty-three where we learnt all the – and a very good course it was indeed, about all the apparatus that the RAF had as far as signals, transmitters, receivers and all the other things, yes, landlines and, yeah, Morse, Morse which was very important ’cause mostly was Morse then, it was before automatic transmission. So …

_And had there been any technical element to your training until that point?_

No, not until that point no.

_So it was just a normal RAF officers training?_

That’s right. You know, bulk standard, churn out another one, you know.
[laughs]. Sounds a very disciplined environment.

Pardon?

Sounds a very disciplined environment?

Well it is, the forces are a very disciplined environment, very much so and you just have to learn that life is tolerable if you stick within the rules. But if you buck the rules then life is not so interesting, so there we were.

How did you personally cope with that transition?

No problem at all, no problem at all, no problem. On the whole I – I’ve been a sort of – not a bolshy, not – not – don’t rebel about things like this, may feel bitterly about them but I don’t rebel.

[12:12]

Hmmm. So what did the course at Cranwell consist of?

Officers War Course number twenty-three, no, that was the signals course. No, we are at Cranwell now –

Yes.

I’m so sorry, at Cranwell, yes … in general a series of lectures familiarising oneself with each of the particular pieces of apparatus, a particular transmitter or a particular receiver or whatever it happens to be, which would be there and you would examine it and how it’s made up and so forth, yes. Oh, and also at Cranwell, because we were … in charge of servicing equipment that went into aeroplanes, we had to learn to fly in aeroplanes and not only that – I don’t mean fly the aeroplanes, but go up in aeroplanes and send Morse messages on our – on the apparatus, so we had to be good at Morse and we also had to learn how to work the transmitters and receivers in the air ‘cause they had sort of effectively flying classrooms in – in de Havilland Rapides or
something, and the … one of the things we had to learn was direction finding. The RAF receivers had a – a little special meter on them which – and aerials that if you were going to fly to somewhere which had a – a transmitter giving out a – the call sign usually of that you used to tune into that and you – you told the flyer – the pilot to fly on a course that kept these two needles like that, and as the signal got stronger these needles went up like that, so you turned the – the volume down again and – and on you went like that, as you got nearer and nearer and nearer to the aerodrome.

_Could you – could you just –_

And then the needles went haywire and you used to do – and then the pilot would be laughing his head off and he’d point and you’d look down and there was the aerodrome, you’d just gone over it [both laugh], so that was that. The other thing was that when you transmitted on a – on a machine – on the – the standard RAF transmitter which I’m trying to – I think it would be the 1084 was the series of things, you had to unwind a long aerial, metal aerial, which on a, stainless steel aerial, was out like this [ph], and what you had to learn to do was to wind this in again before the plane landed and you jolly well used to forget this and it used to get wrenched off you see and you’d lose this and that – you had – all the money was – you had to pay for that, so yeah, oh yeah absolutely. Yes, you had to pay for damaging RAF equipment unnecessarily, oh yes, very much so.

_Is that a mistake you only make once or –_

That’s right, that’s what it’s all about.

_[laughs]._

That is exactly what the training is about. Not doing it twice. So anyway that was that. And then we used to have to transmit from the aircraft and people receive at the other end and that – all good fun. The – the concept being, not that we would do it but we had to know what our men were doing and be in a position to appreciate what the equipment was doing and what the men were doing, which was fair. Very good, so a good course, no problem. So then one gets posted to one’s first station and I get
I’m trying to think where I was posted, I think an aircraft station called High Ercall which is in Shropshire somewhere, and it was a mixed station; it had two groups of buildings that were maintenance and repair where aeroplanes came in to be repaired, and then there was outside of it which was a training establishment for training pilots on Mosquito, lovely wooden two engine, Merlin engines, machines, lovely machines and so my job was to – I was squadron signals officer which meant that I was attached to the – the aero – the airmen who job it was to keep the signals side of the business flying and do regular maintenances and equipment would come in [ph] and – and all that was organised and the squadron – the sergeant, the flight sergeant who was responsible and ran it all, so it wasn’t very demanding during that time. So that was – that was that. There was a station signals officer and there was myself and another officer who all got on well together, and then I was posted to another place which was Cranfield which is not far north of London, perhaps fifty miles north of London, somewhere near Bedford again I think, and the thing I remember there being on that station was that the – the flying bombs were being launched on London from the continent and sometimes their range determinator, which worked by – when it got to the right amount of time I think from which it was launched something worked the ailerons at the back to – to push them straight down which made the aircraft nose dive into the ground and go bang of course. Some of them didn’t do this and came trundling away up to where we were, to the height of about two or 300 feet so you would hear these dud-dud-dud-dud, very noises of the – the little – it’s an impulse engine that fired these things whereby the – a long cylinder with an open end had fuel pumped into it and a spark which exploded this lot, which the blast went both ways, the blast going forward shut some – some doors, some deck doors, but the blast going backwards came out so it got propelled forward. Then the – the wind on the front opened the – the doors again, blew out the exhaust, another charge of fuel went in it, the spark went dong [pinging noise] and it was repeated, so it went tut-tut-tut-tut-tut, very – yeah, dramatic. I didn’t ever see one of those drop or the bits of it but they – they chugged over the aerodrome and people sensibly listened very carefully because it’s when they stop that you, you know, know that something’s going to happen, so that was that. And then from there I was posted … in a very cold winter indeed to India where I was sent up north to … a seaside place just north of … Liverpool on the coast, I’m trying to think of the name of the – but quite a well-known seaside resort
there, where we were put into hotels and given jabs and issued with tropical kit and all that sort of thing, so we didn’t know where we were going of course but we were given … some inoculation which was for yellow fever and that gave us some idea that we were probably going to the – to the – the Far East in some way. So then we were – we were loaded onto a huge troop ship, in my case it was Capetown Castle which had been converted for carrying troops on, oh god, absolutely full up to the gunnels with troops. I was accommodated in the … swimming pool which was right in the bottom of the ship with the ship hull at the bottom of the ship in the swimming pool, so one had a fair idea of what would happen if you were torpedoed, and in the swimming pool, which was drained, there were bunks built up up up all around, so six bunks high and I was in level four on that –

*Six bunks high, that was –*

Yes, yeah, well you could think of a swimming pool, three feet between the – between the – the bunks going up.

*Sounds like you were really packed in like sardines.*

Oh yeah, absolutely, well, you know, tolerable. Food reasonable … had a girlfriend on the boat, who was a WAAF, what was she doing? She was posted out to – to India for some reason which was good, oh yes, there was a whole lot of … what are the people called that put … plays and acts on for the servicemen that are – are sent out to do this job?

*Concert party or …*

Sort of concert party people but there’s a name for them, they’re a civilian group of people who volunteer to do this and are sent out, on our ship they were put in bunks just the same as we were and they were – were – they objected to this that they thought that they deserved something better, the captain of the ship … told them where to go and absolutely rubbish, so when they were carrying – doing one of their acts to – to entertain the troops on the ship they said, ‘You could keep the Capetown Castle, you can wrap it in a parcel and stuff it up your jumper,’ and this didn’t go
down at all well with the captain so there was a – there was a bit of – bit of friction
there, you know [both laugh]. The other thing is in the – oh we went through the
Med, past – first of all we went right out into the Atlantic, to get away presumably
from the U boat threat from the French and Italian – and Spanish coast I think, but
anyway certainly the French coast, we went right out and then down the middle of the
Atlantic and then back again in – through into Gibraltar, through Gibraltar which was
a lovely sight, then through the Med and by that time … the access powers had been
thrown out of North Africa, and they were in Sicily, but there’s a little island called
Pantelleria which is halfway between Sicily and Tunisia and this was reputedly still
manned by the Axis troops with huge guns with concrete emplacements so we were a
bit anxious passing that but luckily they didn’t fire on us and I’ve never found out
whether in fact that – what I say was true, but that’s what the word round the ship
was. Then we get to … to Suez Canal and that’s very impressive, so you – you steam
across the desert in this long ditch, then when we got to the far end of the Suez Canal
the ship docked and to get – give us some exercise we were all turned out onto the
desert and marched through great squads, perhaps ten miles down the desert and back
again, which was fun and, well, there it was. Back on the ship and then back to
Bombay. Bombay impressive place as you can well imagine, lovely harbour, then we
stayed there a couple of days in a transit camp, then I personally was put on the train
’cause I was posted to Ambala in the Punjab just north of Delhi, and a lovely train
journey with the carriage, very hot and sticky, again metal beds, three – three – three
deep on each side of the compartment, just wire meshes and practically no side to the
– the carriage at all, so rather lovely going along this, the Indian countryside going
past you all the time. Ten to three.

_Hmm, I’ve got about five minutes or so._

Okay, right, so then we – we go up through the country … change trains at Delhi and
up to this place called Ambala. Ambala was an old Victorian cantonment with rows
of … barrack blocks marching across the horizon about – each would hold about 100
troops I should think, great big open area places and … anyway, so there.

_Shall we stop moving forward at this point and I’ll just answer a few sort of follow-up
questions quickly while they’re still on my mind [laughs]._
You were talking a minute ago about your duties as an RAF officer on bases in the UK.

Yeah.

And what was the sort of hierarchy there like then, so your flight sergeant would sort of carry out your orders specifically or was he –

That’s right, yes, yes.

More self-motivated or …?

Say again?

I was just wondering what –

No, that last sentence. He would carry out my orders, yes.

Yes, right, so –

But if you’d any sense you – you would make a good working arrangement with your flight sergeant, and he didn’t want any trouble and nor did I want any trouble and he convinced you pretty sudden that he knew more about it than you’d ever learn, so just let him get on with it and that’s what happened. I mean, yes, of course I had decisions to make, but yes.

I was just wondering what – what sort of decisions did you make as opposed to the sort of decisions that he made for you then, with your tacit approval?

I’m just trying to think what decisions I did make … the personnel decisions on – on people coming in and where they were posted, what size unit it was, who was in
which team and so forth. Disciplinary, of course any trouble and I was – I was the
guy that took the rap downwards and also had to discipline the person under me and
whatever it happened to be. What else? Personal at times, I was responsible for the
good … what – what do you call them, the good living, the – yes, the personal
conditions of – of the troops themselves, and also if they had family troubles, that
would be my problem, and so forth. If they wanted special leave, which they always
found every conceivable idea why they had to be posted home of course, more about
that when we get to India. Any more?

*I was just wondering what – what were the technical aspects of your job then?*

Well firstly to understand what the apparatus was and how it worked and then to …
try to manage it because things are always going wrong and had to be repaired, and so
keeping an eye on the – the – the equipment and what rate it was failing and would we
have enough and what about test equipment, yeah, so the management of the servicing
process, yes.

*Hmmm, could – could you tell me a little bit more about that, it’s just –*

Well let’s think.

*If you could –*

Well one of the thing – example was, the transmitters on the aircraft had what were
called motor generators which were rotating machinery and – and a number of
windings on it, the output of which were taken from carbon brushes that worked onto
commutators and that these kept on going wrong and we were very short of them and
they had to be repaired, and the sort of decisions were, this is nearly all right, do we
let it go or don’t we let it go and, you know, all that sort of decision, of trying to
manage the process of not having enough of these bloody things and yet keeping the
aircraft flying, ‘cause keeping the aircraft flying was the number one priority
obviously ‘cause the whole thing depended on, can that aircraft fly. The aircraft is
god.
Hmmm. I think I’ve got time for one last question which I’m quickly going to ask.

Yes, yes.

Did you have any contact with – I’m going to use the word scientist, but the sort of people who were building the equipment for your aircraft?

None at all, none whatsoever, no. The people at places like TRE, I don’t think I’d even heard of TRE, no no no, there was no – no the – the RAF is very structured and all the instructions as to how to do something, how to repair something, the training courses, the length between servicing, it’s all laid down in the particular manual concerned and if – if that’s working, no problem, if it’s not working then you report it upwards through your signals chain, so you never see the technical people at all.

So literally the only help you had was the manual then and what you'd learnt before?

Mostly yes. Oh no, but then there were – between the research and development people there were service organisations that serviced kit, not on the aircraft, in other words that had to be sent back for repair, so they probably had – these dynamos when they gave out, they were sent back for repair and then people somewhere else would decide whether to scrap them or repair them and send them back, so those people would help you ‘cause they were specialists in a particular line of equipment.

Right, okay, and did you see them frequently or –

No, very seldom, very seldomly, no no.

Hmmm.

No, on the whole it worked itself, it did – it did – there was system – was well laid down, well organised, yes, and if you stuck to the rules it – you know, things worked. Mind you if you probably got an air raid and everything blown up or something it would be different. Right, five to.
Hit the stop button.

[End of Track 4]
Track 5

Ready to go?

Okay.

Right, well interview with Raymond Bird on Tuesday March the second 2010 …

Hmmm.

I think last time we –

I was going to say, would you like to summarise and see where we’re going and how much further we’ve got to go ‘cause [both laugh] I’m not [inaud] in any way but you know [laughs], know how – what – what’s happening.

I think we’d – last time we were somewhere in the middle of your RAF career, we had just reached the point where you were being sent out to India.

Right, understand that, yes.

That’s where we are chronologically. So I was actually going to ask you a few more questions about that if we could pick up –

Right, oh so you’d like me to continue on the Indian voyage would you?

Yeah, let’s go for the Indian voyage, I think we talked a little bit about it but it sounds like you were on a ship with a very interesting group of people.

[Laughs] Well – well it was a – all the great linos were commandeered for shifting troops about the world, so the – the Stratheden Line and the P&O Line, they were all – and of course the Queen Mary and so forth, which just went for the hell – hell for leather across the Atlantic and hoped nobody hit it, or they hit anything. Anyway, very cold winter, left from Liverpool, ship which had been a converted liner with
bunks put absolutely everywhere, mess deck – mess decks everywhere and a feeding accommodation put everywhere, mostly for troops, some officers, you know, officers and men different sort of accommodation. We were shoved down as I think I told you in the swimming pool which wasn’t too encouraging. Went right out into the Atlantic, hopefully to avoid the risk of some – well reduce the risk of submarines, down the middle of the Atlantic and then turned in again and came to Gibraltar from the south, or the south west through Gibraltar, through the Med, past Pantelleria which I think I mentioned before and then to Suez through the Suez Canal which very emotive indeed because the canal goes right through the desert and you – you know, there’s these great huge ships just floating on the desert, very very emotive, until you see the canal, then through – through the Great Bitter Lakes which are in the middle of the canal, stretched through Suez to Port Said, then from Port Said [coughing] across the Indian Ocean to Bombay, and on a troop train, which I think we did get as far as that didn’t we, on the troop train across hot sweaty Indian plains to my first posting which was a village called – a town called Ambala in the – in the Punjab. Again a Victorian Indian army establishment, laid out in thorough Victorian fashion for a cantonment with all – all the bits there, the churches and the – the officers’ quarters and the men’s quarters and so forth. Had [sighs] about a year there, I was in charge of … an offshoot signal station from Delhi, so I was the boss of it and I had forty, fifty chaps under me, who were all signallers, or – so all people like drivers and cooks and so forth, guards and so on, and we had a wired compound, two wired compounds with the big aerials in which were there for transmitting all over the world, as I think I explained it was for – mostly for aircraft movements and spare parts, so these huge aerials which had to be switched in order to, according to the time of day, because of the heaviside layer goes up and down with – with the – with the daylight and so the reflecting layer alters so you need a different frequency to do that. So then you had a transmitting station with its aerials and a receiving station what’d be two miles away with its – its aerials.

*Why were they separated?*

Well because you don’t want the transmitter squirting straight into your receiver. So that was that. I – interesting you talk about the transmitting station; when the monsoon comes along the outburst of insect life is fantastic, all the different sorts of
flies and moths and mosquitoes and what have you burst forth onto the thing and the – we had these big transmitters which got very hot with huge valves that glowed – obviously were radiating a whole lot of heat energy as well as radio energy, in fact damn sight more heat energy than radio energy and [laughs] – and so to keep them cool there were blowers and fans and screens and that sort of thing, that – these were underground because of bombing, ‘cause it was a military establishment obviously so the – the – they were protected by blast walls and – and possibly ten feet down, in a pit rather than underground would be a better way of putting it. And when the monsoon came this huge array of insects come and completely overwhelm the air conditioning system, they just get sucked in and so there’s thick wads of dead and squibbling insects all being fried by the heat, all over the – the grills protecting the inlet, so that effectively stops you transmitting, you know, just mere insects, so that’s how wars and won and lost I reckon at times. So anyway, you know, you had to go round and scrape them and get the damn things going again. Then another interesting thing was the transmitting station had been on the old racecourse, because cantonments had racecourses … for – for the officers’ lives there, you know, and own their own race horses and that sort of thing. But that had all gone, so … the – the racecourse itself was disappearing under grass and shrubs and what have you with these – these aerials all dotted around on big towers now, just the same as you see dotted around the countryside here, and … when the monsoon comes and everything floods, the river which has been a dry river bed with gravel sides suddenly becomes a surging mass of brown water which spreads out all over the countryside, possibly only two or three inches deep, but everywhere ‘cause it – the countryside is absolutely flat flat flat and the – the racecourse used to get flooded and then the danger was, not the floods which little houses were built up to, you know, but the – the snakes, the water went down all the snake holes and so the place was a squirming mass of snakes which was – and they didn’t want to attack you but if you tried to move them or something they might object, you know, so that was an interesting – then we used to have snake dogs whose job it was to find the snakes and bark and that sort of thing so you could get rid of them.

Do you mind if I just push the door shut a sec to –

Sure.
... just thinking of background noise.

Absolutely, so that’s – that’s snakes and that place.

What other problems did you have?

What – being in this [coughing] particular site in India?

Hmmm.

[Coughing]. Boredom … lack of female companionship … officers like myself had a mess where you – other officers from other sections, groups, stationed on the same place used to go, it was the officers’ mess for Ambala so there there was – there was social life in there, but a lot of drinking of course, and very nice mess, very good mess. You had a – a bearer who looked after you, your personal servant, so he would – when you came back from work, he’d have all your uniform laid out, pressed ready, you’d – and a bath ready, bath put – the bath was a tin tub and the water was brought in by a special bloke whose job it was to carry water around on a stick with – with two tin cans on each end and that’d be poured in your bath that would be there. You’d have your bath, change into your … mess dress, such as it was, because in the war you didn’t have the pucker mess dress, but you had your best blues which you used to wear, then you would cycle [laughs] hot sticky all the way to the mess, where you – you’d have your drink and then when the time came to go in to your evening meal, your servant would have changed into his mess dress ‘cause he served you and he sat – stood behind you all around the table and had nice sort of cockades on top of their hats with the RAF colour in their turbans on their heads, and so all very civilised indeed. Food good … lot of drinking, lot of drinking, and the … one of the commanding officers’ jobs, which I didn’t realise at the time, was to get the mess bill, the mess – the bar – the bar book, that’s the word I’m looking for and look through it to see who was putting it – stuffing it back a bit and I was – a little note, ‘Please would you report to the CEO’s office …?’ Christ what have I done now and the more wiser bloke said, ‘Bar bill, I bet it’s your bar bill, it’s probably too high,’ I said ‘What do I …?’, ‘Don’t worry, don’t worry, this has happened before, many many times,
you’re not the first,’ [laughs]. So anyway go into see the – salute him smartly, ‘Sit down, right, right, how are you doing?’ ‘Oh very well Sir, yes,’ ‘Good good good good good, having a good social life?’ ‘Oh yes Sir, absolutely grand,’ ‘Like the mess?’ ‘Yes, super,’ said, ‘Well I would like to remark that your – you’re obviously a very hospitable bloke and you’re obviously buying your friends a lot of drinks, I would suggest you reduce it a bit,’ [laughs] all nice, beautifully done, so you got the message and you cut back on your – on your boozing a bit, there we are. And of course the young officers like myself, twenty, twenty-two were quite different from the older civilians officers that were still in the air force who were career people – people, you know, this was just a passing phase, a war, you know, what’s a war, and anyway the – that’s a bit rough, but they were career men and that’s what they were in there for. So the younger lads used to have high jinx in the mess and we’d have – a series of very rough mess games indeed which used to break furniture and all that sort of thing. And then you would – you’d have a kitty and it was known it was going to happen, you know, and you’d put money into this kitty so that – so when furniture did get broken up then there was something to do with it. Some of the – the games I can remember once is trying to get right around the mess room without touching the ground, which meant jumping from furniture to furniture all the way around, hanging on to picture rails that were broken, that sort of thing. Then the other one was leaving a trail of your footprints across the ceiling, which had to be done by building up a sort of tower and lying there and making your feet go on there and the other was a – a horrendous game called British Bulldog, you developed, you divided the people playing into two teams and one team made a long line holding onto each other from the wall or something stout, and the other people one by one rushed across the room and jumped on this line and the object was to break this caterpillar of – the first time, which was all very good fun and so forth. So anyway a good time was had. Then there were mess nights which was a much more formal dining – dining in night and then the usual thing going – there was a – a protocol for who spoke when, like the president say – tap on the table and say, ‘Mr Vice,’ and Mr Vice would then stand up, ‘Gentleman the Queen,’ you know, and then you would taste our King or whatever it was then, King, it must have been King then. And anyway, so that was all very good, and then the port went round and the port has to go leftwards, so you have this – there’s this circle of people, say twenty blokes there and the bloke on your right asks for the port, you mustn’t pass it across there, you know, all sorts of horrible things
happen to you if you do that, so it had to go right round, oh silly things. But these things are done for a reason, they are to weld together a lot of disparate people into a team, and it is – the army is particularly good at it of course, the regiment, what was the regiment’s history and all that sort of thing, and if you want the guys to go out and get themselves killed it’s the only way to do it … so good mess life there, I had a lot of freedom because I was a little CEO on a unit all on my own and the main people didn’t want to know about me, they had to provide me with various services and that sort of thing. Then … the end of the war came and the commanding officer, to celebrate this, did a very rare thing, he bought a barrel of beer and put it out in the middle of the aerodrome and everybody could go and have free beer, it was hot and stinking, it was absolutely terrible but he thought he’d done the right thing, but there you are, so that was that. The … end of the war for me and most of the youngsters didn’t mean much because we’d still got to sweat it out till our demob came which might be two or three years on, because the first in first out sort of – all – oldest in first out, so they could go back to their wives and kids and – and the – those like myself who were – had to wait, the … just think what else to be said about Ambala before we move away from it.

_I’ve got a few quick questions actually have occurred to me as I’ve gone along, or I’ve brought them with me, it’s – talked quite a lot about the sort of social life there but what was your – what was your day job like [laughs]?_

My day job was running a signal station which was very formalised and had been laid down and there were – every … operation in – in the services has certain instructions, printed and signed and dated, to describe what everybody’s job is, the object being so that if there is a – a turmoil of any sort then there was a system which people fit into, so they can be posted, or they go sick or they’re shot or die, the – the thing has to continue to run so everything is described, from KR & ACIs, Kings Regulations & Air Council Instructions, which are the great big thick manual which tell you what to do, right down to individual who’s – if we were – did this on a regular basis then there’d be a list of instructions what could and couldn’t be said, how you did it and how you recorded it and so forth. So yeah, and obviously there were technical instructions for servicing equipment, equipment – transmitting and receiving instructions, how to work the radio sets and send the messages, so all this was all laid
down. So when I came in as CO, the system was all there, I hadn’t got to invent a system, I had just got to keep it running, most of the time, or when I was there was due to the fact that the war was winding down and the unit was getting smaller and smaller and smaller, so there was less staff to do what should have been less – less traffic but wasn’t necessarily so.

_Hmmm._

Does that answer or do you –

_No, I’m – can we go back a little bit and talk –_

Yeah.

_A little bit more about the actual transmitting and receiving parts of the –_

Yeah.

_I was quite interesting in – you were sort of describing you had to change with the frequency at different times of day or –?_

Yes, that’s still – still true, yeah, anyway anyway.

_Yeah, how do you do that, that’s – what’s the procedure involved with …_

Well luckily the sun goes round the world at a – a set speed, so you – you know what time you’ve got to change frequency because it depends on the sun and so as I say there’s a list of instructions, three o’clock you’d change onto such and such field, so what would happen is the master end of a link would say, ‘We’re going to change frequency now, we’ll be off for two minutes, okay?’ Boing, and then the test call would go out on our frequency, set up the link again, on you go. Not much – oh all very straightforward, yeah.

_So just procedural written down, just follow it._
Oh yes, yes yes yes.

_Hmmm. So did you actually have any sort of technical scientificy jobs to do or was it just following the –_

Oh yes, yes, being technically trained and got a degree in electronics, woohoo [laughs], and I had to be able to cope if the technicians, corporals and sergeants and other people who were – had very good RAF training many of them, often joined the air force as boys before the war, and they’d become what’s called Brats posted to Halton in – just down there, this part of the world, and where they got a very good very good training and came out and formed the backbone of the RAF Technical Services. Well, like any officer your job is to look out for things that are different or going wrong or not procedural and then sort it out, yeah, so hmmm.

_Could you give me any examples of this sort of thing or …?_

… [laughs] One thing I can remember, for some reason we had delivered to us a huge drum of lead covered cable, about an inch and a half in diameter cable, huge drum about five feet high and about three feet wide, must have weighed something like five tonnes this drum of oil and the lorry came up and delivered this to the – the gate and we signed for it as, yes, this is – we both read it and we put it down on – on the ground and while we actually had it we didn’t know, so you don’t make work for yourself, you just keep bloody quiet, somebody may tell you, ‘Ah you’ve got to do this with that cable,’ and as the weeks and months went by the termites got into the wooden frame of the – of the – of this great big wooden drum and it – and started to eat it and also the monsoon came which made what had been lovely hard ground into sodden mud, so this heavy reel of cable started to descend downwards [laughs] and spread out into a sort of oval mass, so anyway it was still there when I left [laughs], so you ask what did I do about it, nothing is the answer.

/[Laughs].
That’s – ah interesting point, there were obviously many human points, like particularly poor chaps whose girlfriend kicked them over and jilted them because they were months and years away from each other and so forth, they’d meet somebody else and … you get one of these messages and I’m trying to – what – thinking what it was called, there was a nickname for it or code name for it, ‘Oh he’s had a blighty,’ or whatever it was, and then some – some of the chaps were deeply upset of course and very very – and went into declines and that sort of thing, tried to get them to do something from that. And other ones were just sheer skivers, and I had an awful trouble, we had three cooks and one of the – these cooks went off on holiday to meet some – a friend in Delhi which he’s perfectly valid to do, and when he got there he became sick, perpetually sick, because what happened is first of all he bribed an Indian doctor – an Indian doctor to produce little chits of paper which came whistling through the post, ‘He’s got a sore throat’ or something, ‘can’t come back yet,’ and then obviously it became a war then because I then got the – onto the military police in – in Delhi to say, go and see this chap, and they went and said, ‘Well he seems all right to us but his doctor says he’s ill,’ I said, ‘Well he better see an RAF doctor,’ and so it all started and the cunning bugger, you know, just as he was about to see the RAF, woof, he was off somewhere else, so – which he hadn’t got permission to do, but then, you know, he’d got a jolly good reason why this was for some – so he – yeah, very very clever at working the system. But that was a very great – a small example, most – most blokes got on with the job and wanted to see it through, straightforwardly.

*Were you the only officer at your little base or?*

Say again?

*Were you the only officer at the radio base?*

No, I had a – another officer, I was – we were both flying officers, which is the second to the lowest, yeah, yeah, and he – he was the admin officer and I was the CO and technical officer.

*Hmmm.*
So as an admin officer he’d look at all the sort of guarding of the place, goods inwards, out, the mess which had – was – and no, had their own accommodation, blokes lived on site, so this meant all sorts of Indian servants coming in and going out and that sort of thing, yeah.

_Hmmm._

All – all – very – very civilised, all well done.

_Hmmm._

The site having been an – a cantonment for years and years and almost entirely army dominated, it just happened to be there were some air force people on it and that meant that the town of Ambala was – or the cantonment of Ambala, the town of Ambala was a – an Indian town, full of people so tightly packed you could – you could hardly move if you can understand, very narrow streets, poor sanitation, you know, you know, and the cantonment however would have been laid out methodically on a grid pattern, roads number 1357 and that sort of thing, all the way across, lots of quite good quality bungalow housing for officers and all the civilians who were associated with the police and what have you, railway people – ah it also had a – a railway terminus, no not terminus, railway – well a major railway station, so that produced a lot of traffic and you had a bizarre with a lot of business going in and out and it was on the great trunk – north, ah, the great trunk road runs right across India, all the way from Peshawar right up in the North West Frontier – all the way down to Delhi and then on from Delhi right down to Calcutta, a very famous and long road which troops had been marching up and down, _ad infinitum_ and we were on this road. So there was – there was through traffic, I suppose that’s what you could say. The [sighs] … the cantonment had a series of clubs which were mostly – these secret or semi-secret societies, starting off with the Masons and – which was fairly well entrenched into the – into the RAF and – well and various other people like the army people, we’ll come back to the railways in a minute. The – and then there was the Oddfellows, another society and then there was the … ah, I always get them mixed, there was the Rotary and the other one that’s rather like the Rotary, it – there’s an age
difference where if you join one or – one or another whatever one, and so on. Some of these were officer centred like the … the Masons, some were other ranks. It enabled the service people to get away from the service environment, have a society of their own and, you know, play – play bridge and tennis and lots of social activities, there were some women because many of the civilian people had their wives out there, and so on. Hmmm …

*Were you a member of any?*

Was I? No, I was nearly into one but I didn’t like the secret society business of it so I decided not to, but I was very welcomed there and I was a guest and invited in and so forth, I’m not thinking the Masons, no, I’m – and so on, this was – I think it was Rotary, but they provided a very useful service and they’d been there for twenty, thirty, forty years, long before the war. What else to be said, there was a cinema where the seating was wooden benches down below and upstairs in the balcony they had sofas like this, stuffed sofas full of bugs which bit the leg – back of your legs as you sat on it, anyway, but otherwise they were – but it was nice to go to – to go to the cinema. But it was hot and sticky and un-air conditioned and broke down, but apart from that excellent. What else to be said?

[27:08]

*Did you see much of like the Indian part of the town or were you more in the –?*

No, you were quite rightly discouraged from going down there because … firstly Ambala is on the junction line between the Hindu part of India and the – and the Muslim towns which became Pakistan and was one of the areas where there was terrible bloodshed at partition time, which was just after I left. Though the Jai Hind movement, Quit India with Gandhi and so forth, was under full swing and there were riots and things, very frightening riots. And what else to be said? As in most countries where an occupying or any other foreign army is in there, they’re kept quite separate from the locals, otherwise there’s nothing but rows and fights and things so – as – just when the Americans came to Greenham here, their life on the whole was quite separate from the people round about. Not entirely true, they did – the Yanks
did go out and have – drink in pubs and that sort of thing, but it was a much more
friendly environment, you couldn’t – there’s no drinking in pubs in India for instance,
and certainly not in Pakistan. Now let’s think what more to be said about life there?

[28:30]

Oh, one interesting thing, did I mention that I had a – an outstation in Shimla? Ah
right. The … summer capital of the whole of the Indian subcontinent was Shimla,
and so the whole of India was ruled from Shimla for six months of the year, Delhi
moved up to Shimla. There was the vice regal lodge, beautiful Scots Baronial
building about a mile out from the centre of Shimla. Shimla itself is on a – a ridge of
– a ridgeback of hills on the foothills of the Himalayas, if I had to guess I’d say it’s
four or 5,000 feet up which is absolutely nothing of course when you look at the
20,000 in the background, which are forty miles away, I mean not right up like this,
but the snow barrier of the Himalayas is – is visible from Shimla. Shimla had a lovely
granite Scottish church and a mall which is a nice flat place for people to walk and a –
what would look just an English town hall in the middle of it and an English type fire
station, a bit of home from home in a way, except of course that it was a very steep
hillside and there were shanties all over the place, up and down and so forth.
Anyway, in Shimla I had a small group of airmen, three of them, running a little
signal station. What they were there for nobody ever really knew, we used to send
signals to them, ‘Are you working okay?’ ‘Yes, I’m working all right, thank you very
much, goodbye,’ presumably this was a hangover from when the government was
actually run from Shimla, which it wasn’t in the war, so I thought it was a good idea
to have a – to go and see these lads ‘cause it was in Shimla and what have you and so
I said, ‘I’m coming,’ and so forth and my pals got me thoroughly boozed up and sort
of shovelled me onto a train. Oh the first class passengers travelled much better, you
actually had a little compartment and a bed and so forth, and your bearer went with
you and he would get your meals for you and that sort of thing at the station. So they
shovelled me onto this train which travels slowly all the way to a town called Kalka
which is at the foothills of the Himalayas and then you get out and you go on a little
tiny train up on a delightful hill railway that climbs up to Shimla, it’s still there and
it’s still working, and a typically British type railway with all the controls and all the
procedures absolutely rigidly run, beautifully run too and it’s still going. So anyway
you chug up there, round and round in and out holes in the mountains where the road – railway goes through and it eventually gets up to Shimla. There being one rather notorious thing where a tiger jumped onto the train and killed the engine driver [laughs] which was – but didn’t happen on my train anyway, but everybody talked about the tiger. Anyway, so you get to Shimla and then I go to a hotel, or did I go to a mess? Did I go to a hotel or did I go to a mess, I can’t remember, but anyway I went to there and saw my chaps and yes they were very happy and sort of did my stuff and then – oh one – one other interesting thing was that I had a – a girlfriend, euphemistic, in Ambala who was an Franco-Burmese lady, she was very old, she was thirty and she [laughs] had come out of Burma when the Japanese invaded Burma and joined what’s called the WACIs, Women’s Auxiliary Corp India, very much the same as the ATS, almost turned into the ATS, and – and she was there. And she’d got … I think it was three children, she’d had three children, she had been married, well still was married presumably to a Irrawaddy river pilot, the Irrawaddy river steamers were very very famous and they chugged – chugged up and down to Mandalay and Kipling wrote a song – On the Road to Mandalay, and I can’t remember all the words, where the something flying fishes play and so forth, hear the paddles chunking from Rangoon to Mandalay. They ran these boats up and down the river, but when the war came god knows what happened, you know, Japanese coming in. Anyway, so she was in the WACI there and when I was going up to Shimla she said, ‘Oh I’ve got my three children in an orphanage up there, would you take them some presents?’ ‘Yeah, sure,’ so all these were nicely wrapped up and I got this thing you see, and I got to this orphanage and they welcomed me in and these three children appeared and they said – they all said, ‘Daddy,’ which was [laughs] – so we had to explain our way out of that one. Anyway, but it was just interesting and these poor kids, you know, mum down there, kids up there, but, you know, they seemed to be happy enough and that. So – but who knows, who knows what happened. You know, so anyway the other thing about Shimla is that … the town is infested with monkeys because they are – the Hindus won’t kill them and they live in great gangs on the roofs of the houses, swinging about and they’re extremely mischievous, horrendously mischievous, if they can get into a room they’ll trash it and so you have to shut your windows all the time and they swing around on the electric cables, short circuiting them and making flashes, but they don’t seem to get hurt [laughs] until the cables get hurt, so anyway, that was that and there we go. What else to be said about Shimla? A delightful town,
I – I went back there thirty years later, not much had changed really, not much had changed, it was Indianised but no, not much changed. It had grown to about twice its size. It was interesting too because many of Kipling’s stories feature hill towns like that, and if you read Kipling then you – you – you immediately recognise the. Right, so we’ve been up to Shimla and back again.

[35:17]

Ah, next thing to be said, how do I amuse myself? I’m always – I was born in the country, rather like this and I’ve always had a – had a gun and – and been shooting and – rabbits, pigeons or what have you, and when I got into the RAF I wanted to continue this shooting and I did some in England when I was posted round air force stations in India, and then at that time the landowners, because you were in the forces, were very good and they said, ‘Oh yes, you want to come and a have shot round, yes, you can walk round with your gun,’ so very very understanding. When I got out to India what – but there was nobody there to join up the shooting, so – but you could go shooting so I used – well first of all I had a shotgun which you – next – go back a bit; what was I going to shoot? Black buck, Indian antelope, there were big herds of Indian antelope, the females are brown, dun coloured, merge beautifully into the background, and the males, the black bucks are black and white, black on their top surface, white on their underneath surface and strangely enough though they look – if you’d just had one they would have said, ‘God that’s glaring,’ but when you get it in the bright sunlight and dappled shade, they just merge in. But anyway, the does form large packs, which you don’t shoot, this is all the rules set down by the – the British Army who had been shooting there for years and years and if you went into a British or an Indian Army mess you would find the walls absolutely covered with the trophies of the officers who had shot these in various places in India, as you can imagine, lions, tigers, all different breeds of deer, hog and what have you. The sort of – the ignorant and the – what – bleeding heart type of people get very upset about this, in fact it was extremely sensibly run, because if you … only shot the animal with the longest horn, which is what you were trying to do and you were trying to get the twenty-six inch horn on the wall where the other guy had had a twenty-five inch horn, and you go a long way and have a whole holiday to try and get this long horn, or set of horns or whatever it happened to be, the longest horn is the oldest male and he may
be getting beyond his breeding age, so weeding out the males with the longest horn let
the younger bucks, who were better at breeding, come in and take over the harem, and
of course you didn’t shoot the does. But come – just before I go onto what I did
shooting, but come partition when we got out, then the poor old Indian antelope had
had it, the – the locals who had been suppressed by the – the British run Indian police
from shooting or having any sort of firearm, then – I mean and they were not starving,
but they were – they wanted protein, they for instance cut down telegraph wires and
strung them between trees and drove the whole hoards of does at full speed at this lot
so they’d break their legs and then they’ll kill them, so it – the – the whole world –
and now the black buck is practically extinct in India, well it was flourishing when the
Brits were there. Tigers the same, tigers were protected in that you could only shoot
tigers if you got a licence, and you only got a licence for your firearm if you went
through the magistrate and had a sort of set of procedures to go through, so – unless
you were a serviceman like me where you didn’t have to go through that. But the
locals couldn’t get guns. So … I used to go out shooting these black buck, I was
lucky enough to have a bearer who was a Hindu and a car driver who was
Muhammadan who got on well together nevertheless and they’d go with me and we’d
drive down a well kept road for perhaps twenty miles and then we’d go off onto the
hard baked mud or plane, and so we’d bump across that and we’d go to the local
villages, and go to local villages, they liked us shooting because the – these animals
were a plague as far as their crops were concerned, so you – we were – there would
usually in every village be a shikari which means a – a hunter or that sort of thing.
And from – from – for a tip he would join us to take us to where the – with luck they
got the corpse too, that’s why they did it, well no they did it for all sorts of reasons,
they liked it as well. So then they’d say, ‘Oh yes, there’ll be a big buck so and so,’
and then having sighted a big buck, with the long horns you hope, you would then
negotiate with a local chap with a bullock cart to – great big wooden wheels that
chundled around, and a sort of flat back with just a little high parapet round and he sat
on the front and you – you’d lie down in the back of this and there’s some stinking
rags with your – your rifle beside you, or your shotgun in my case, before I got a rifle
which I did later, and he’d take – and the bucks were quite used to these things, so it’s
a decoy, you know, there’s a word for it, stalking horse – no, it’s not even a stalking
horse, but anyway, on you go until you get within shooting range and then you’d –
you’d try and shoot your buck if he hasn’t – didn’t disappear. Because a shotgun has
only got a range of say forty yards so which means you’ve got to get pretty near. But then I bought – towards the end of the war of course the … army officers, and some of whom were civilian army officers who’d been there years, or families had been there years, there were going home to England and so they sold their good rifles and I bought a very good rifle that way … it’s a calibre you wouldn’t see now, it’s a 3 O O and this I – I used for shooting bucks and I’ve got a hall – a stuffed head down in the [laughs] – I’ll show you in a moment, but so you know, I did actually do it and it was good fun. And then you bring the buck back – ah, having shot the gun, the – the thing, then you had to rush like hell to get to the animal before your Muslim bearer got there, ‘cause he’d slit its throat because he wanted it to be Halal and therefore had – that religiously the throat had to be slit and it had – you couldn’t shoot an animal that hadn’t been religiously bled. But unfortunately if you slit that it ruined the head to having it stuffed you see, so anyway that was a little war that went on. Then you would bring the thing back, skin it, send the – the skin away to be treated and also the – the head to – to be stuffed and mounted, which would be done very skilfully but unfortunately the stuffing which was just mud swept up on – off the ground, was beautiful in India but you got it home here and as soon as the damp got it it – the poor old buck’s head went down like this with a series of double chins all down the front. So I had to take – when it got home I had to get all this muck out and put plaster of Paris inside it and it looks quite good now, anyway. So anyway that was that. Going back to the buck, so then the carcass would be taken to the mess and given to the mess sergeant and say, ‘Cook – would you be prepared to add this to the menu?’ ‘Yes of course, what – what evening?’ ‘Well, tomorrow night,’ ‘Bit – bit soon Sir, make it Thursday or Friday,’ and so I’d then tell my friends that buck was on the menu and – the commanding officer as well of course. So that was how it worked. Also there was some shooting of peacock, but not very because – lovely birds peacock but they were a menace to the … the farmers because they were holy to the Hindu religion, so you had to be rather careful how you – where and how you shot those.

_Hmmm._

I went shooting wild boar … I – there’d be more truth to say trying to shoot wild boar. We went about thirty miles I suppose from the cantonment, there were two or three of us with – with rifles, and this high grass with mud and slosh underneath with paths
that had been made through this by the boars all over the place, and so you – you would go and stand in one of these paths with your gun and then the beaters would go – so sort of shout and bang and come down, trying to drive the boars towards you you see. You would hear the rustling of this creature there, or several of them, didn’t know where they were and suddenly one would rush out, possibly only six or eight feet away and you’ve got to somehow shoot it, because it had got nasty horn – nasty jaw fangs or whatever they’re called, that really gore you badly, people got killed quite easily at this. Anyway – but anyway luckily I didn’t have to face a boar and other people tried to shoot them and didn’t and so forth. And then of course the other danger is of course the land is as flat as flat as flat and if you shoot at something and you – you miss then the – the dear old bullet goes on for a mile and a half or something, you know, well a half a mile anyway, so you can kill people a long distance if you’ve got nothing solid to shoot into. Hence why they put people on makans, that’s little – a makans is a little platform built up six or eight feet above where you shoot from, where you have a tethered goat below you and then a tiger comes out, but that’s another story. Anyway, so there were various occupations to be – oh there was a swimming pool in the – in the cantonment where you used to go and swim quite often. I think I’ve covered most of the occupations, the mess, the swimming pool, yes.

[45:52]

*It occurs to me you’re in India very soon – very close by independence?*

Very much so, the – the riots were going on at the time, Jai Hind Quit India – another story. I had this – this – this girlfriend in Ambala and I wanted to go and visit her again and I was posted to Delhi which was 100 miles away or so, on the railway, and so as an excuse to go back I organised a water polo match with my old pals backs in the cantonment, so I got all the lads and we got on – got to the railway station … and the train wasn’t due in for three or four hours, Indian railway stations are sort of like small cities with masses of people camping on the railway station waiting for days for their train, and there was a riot outside and the troops were all around the railway station and there were these shoutings and shots, and very frightening indeed, but then they didn’t get into the station and when the train came we chugged away quite safely.
Got to Ambala where they had the polo match, first chance I— I had I went round to
the— the house where my girlfriend lived and I tapped on the door and a great big
staff sergeant weighing about twenty stone came, like this [demonstrates and adopts
deep voice], he said, ‘Yes Sir?’ I said, ‘Oh I’m sorry, wrong house, wrong house,’
[both laugh], so so much of my— my trip to play polo. So there we are. So that was—
then I was posted down to Delhi which was quite a different kettle of fish, that was a
capital city, big messes … the messes there were graded. In Ambala there was one
mess for— from groups captains down to acting pilot officers, but in—in—in Delhi
there was up to flight lieutenant and then the senior officers had another mess, so I
was in— obviously in a junior—junior mess. Very very hot in Delhi, horribly hot … I
was allocated, as everybody else, a bicycle to—my mess—back again. Lutchen’s, the
great architect designed New Delhi as an imperial statement and there was a thing
called Raj Path, King Path right up through the middle of New Delhi with great big
wide lawns each side, possibly it’s a quarter of a mile wide by possibly two miles
long, with India Gate at one end, rather like a great big Marble Arch, and at the other
end two huge buildings which were the secretariat buildings up on a hill, north and
south secretariat or— and then beyond that was the vice regal lodge which you
couldn’t see, it was just over the hill. [Laughs] There were two architects who did
New Delhi and I believe that the vice regal lodge was not one of Lutchen’s bits, but
the— the two big blocks, secretariat buildings at the end of the—were his, so it was all
— he—so it said, cunningly designed New Delhi so as you came down Raj Path what
you saw was his nice secretariats, and not the vice regal lodge beyond. Meow. So
that was that, anyway, Delhi, very hot … pleasant place to be in because of course
there were restaurants and life of various sorts you could go to, and there were all—
the history places there like the Red Fort and … oh, Jama Masjid and other religious
things. There was the Old Town which was a seething mass of humanity. And Delhi
is about the fifth town that has been on this site, so there are ruins all over the place,
lovely tower called the Qutab Minar about twenty miles out—about 100 feet high, just
standing there, lovely brickwork, well worth a visit, Lodi tombs, all sorts of things to
see around there.

[50:18]
So I was in Delhi for about six or nine months before I won this lovely lottery called mid tour leave, have I talked about that?

_I think – well I think you’ve mentioned it outside the actual interview._

Okay, well so I’ll go on then [sighs] … the war was over and your term in India was three years and if you were only twenty-two or something as I was, the chances of getting home and early release were small, so the joy of getting mid tour leave which I won as a – in a lottery, which I hardly ever win a lottery, was absolutely marvellous and so I said, ‘Look after my kit,’ ‘What, look after your kit, why should you look after?’ so I said, ‘Well I’m coming back,’ ‘You’ll never come back lad, take everything, don’t leave a thing here,’ so that – and they was right, this – the old sweats were, so I packed all my gear and down to Bombay which was a great trooping point, about ten miles north of Bombay there’s a sub-divisions called Wurley on the coast which is quite – was quite a rich place and is now the place where all the film stars live and that sort of thing, rich houses and – they’d been commandeered and I was in one of those, and I waited and I waited and I waited, because what happened was that … if a shoot – troop get – ship came in, when they loaded it, the guys going home on release got priority over the guys who were going home on mid tour leave, but the guys on mid tour leave didn’t mind because they were guaranteed three months leave when they got to the UK, so this was an extension of the leave in effectively, so I had a super month in – in Bombay, we were members of the poshest club there, the Willingdon Club, which was a real bit of the Raj, beautiful place to visit, yes, and well looked after.

_Could you describe it to me?

Well I think it’s probably what – what you would expect from a – an Indian … clubhouse, there would be the normal lounge with chairs everywhere and a bar and waited on hand and foot of course, every time you went a chap came and said, ‘What do you want to drink?’ and so forth, had bar chits all the time, never paid any money, you signed for everything, outside there would be a lawn and where you drank in the evening it wasn’t too mosquito or what have you, and then there’d be swimming pools and tennis courts. Very social, very well run, very very snobbish and I can’t
remember what – yes, the Indians were just about allowed to go in, just about, so it was very very – and of course independence wasn’t far away, so it was a – there wasn’t any friction, but … yeah.

Was –

There was in a way, ‘The sooner you bastards get out of the way and we can run our own country the better,’ of course, some of them, others are, ‘What a shame you’re going, as soon as you go it’ll – it’ll relax into anarchy and we won’t have law and order,’ so it was very much a balance.

What – was it clear at the time that India was going to become independent quite shortly?

Oh yes yes yes. There were diplomatic visits backwards and forwards, the Viceroy would have – oh, Mountbatten came out there and became the first governor didn’t he, whose job it was to – to set up independence, and then his wife – wife had an affair with general something so it really wasn’t quite as good as it might have been. The – oh yes … the Brits tried desperately to do it in an organised way, the pressure, particularly from the Muhammadan side to have – to bring independence forward and none of this messing about and let’s – let’s get our fingers into the – into the – the honey pot as quick – soon as we could, forced the Brits to agree on a partition earlier than we would have liked. And of course the effect was a vast slaughter of 2,000,000 people, so that’s on our conscience in a way. This was when the Punjab, where I had been, which consisted of separate villages where – which were Hindu and Muslim and Sikh, there was vast slaughter of whole villages being slaughtered, and terrible, railway trains with every single person on them killed, you know, the train would go on – would be stopped by the – the rebels, whichever side they were, it wasn’t necessarily just the Hindus or just the Muslims, either, and then they’d slaughter all the passengers that they didn’t approve of, that were the wrong religion, and then the train would chug off to the next village – next town where they’d really got a carriage load of corpses, horrible. Anyway, not much is said about partition because neither side wants to talk about it and we didn’t do too well, so there we were.
What were people’s –

I wasn’t there in partition by the way.

No, no, I was just –

About six months after I left I think.

What were the feelings of people – well people you were talking to in the run-up to this?

Say again?

What were the feelings of people you were talking to, other Europeans there in –

Ah, other Europeans wanted to get out. Well who – no that’s not quite – not really true, of course the people that had really made their careers and their father’s careers and their father’s father’s careers had been in India for years, since good green victorious time and even earlier, fifth sixth generation had been out there, they were in a terrible state of course. Some of them wanted to stay on and in some of the novels there’s – there’s – *Jewel in the Crown* I think it’s called, there’s a series of novels where an army officer, I think a colonel called Tusker, he decides to stay on and everything falls apart and he’s got no – no pension ‘cause he didn’t think about a pension and his – his poor – and he dies and his poor old family are left behind, and the Indians don’t want to know, and oh, sad, very sad ‘cause these people had devoted their lives to India and their generations before had done it and they’d done it well, they did not want to feather their own nest, they were – they were not on the make, very very good indeed. And of course in Addiscombe near Croydon there is a school – school, a training college which was devoted to training the Indian Civil Service, ICC and – ICS, had better get it right hadn’t I? [laughs] And the crème-de-la-crème of – of Oxford and Cambridge and – families joined that and 50,000 Brits ran 200,000,000 Indians, terrific, and well and – and quite a lot of the Indians … to our faces anyway said, ‘We don’t want you to go, life’ll just become chaotic, everybody will be making money and there will be no law and order and so forth,’ to
everybody’s rather surprise that only half happened, yes, there’s a lot of corruption and fingers in the honey pot, but on the whole they – to everybody’s surprise Indian democracy has survived. Pakistan democracy is another question. Now, let’s think. And of course [laughs] there are more Muslims in India than there are in Pakistan, there are 200,000,000 Muslins in India, so when you think of India as being Hindu and Pakistan being Muslim, not quite true, so there we are. And then between the two, the poor old Sikhs who I’ve had a lot to do with and are a fine lot of people, they – they were – the Sikhs were particularly concerned with transport, they ran the railways and the railways again were a terrific British success. The – they’d lived on the wrong side of the tracks, have you heard that phrase, the wrong side of the tracks?

Hmm.

I – it applies particularly in America, but it applies in India as well, whereby there is one side of the railway, usually has got the cantonment with the – with the officers and what have you, and on the other side are the servants and the people that say – and … the railway officials who were mostly Sikh were on – lived on the wrong side of the track, which I used to visit them and so forth, yeah, ‘cause I – why did I visit them, the Sikhs railway people? Ah, because there was a club, if you were junior officer like me, way down, you got a bit fed up by being – having to patronise all these bastards in the – of higher rank and they were a stuffy lot, you used to look around and there was a chota club, a civilian club in which some of the railway Sikh officers used to belong and they used to invite me back for a drink to their house and that sort of thing, yes, the Sikhs did drink, yeah. So that – that was that, yeah. And … let me, I’ll just go a little bit further.

[59:59]

The – going back to Ambala from Delhi, one of the messes that I had a friend in, who was an … what some people would call a chi-chi, or others would call an Anglo-Indian, an Anglo-Indian can mean an English person who has been resident in India for a long time, or it can mean a half cast where usually a British Victorian soldier had shacked up with a – a local girl and these Anglo-Indians formed a better educated but not British class, they looked to England as the home country which they’d never
been to and they had learnt the geometry of London about, yes, ooh you can see the Houses of Parliament from – from Trafalgar Square or whatever, and they knew the name of the roads, it was very very sad, very sad. And then probably never would go there either. Anyway in this particular mess – [sighs] and the – the regiment was the Royal Mountain Artillery Regiment, an Indian regiment that had screw guns, it had – have you – have we had this bit?

I think we’ve talked about screw guns, these are the ones you – you can put around a horses carriage – mountains –

That’s right, on a mule, on a mule, strapped each side of a mule, that’s right. He was an officer in this and I used to be invited to his mess and he used to invite me to his – my mess, but we were both right down at the bottom of the pecking order. The Indian messes were well run; they used to have a band, they used to play when there was a – a dinner night on the lawn outside and they used to play English and Scottish tunes just slightly with an Indian tempo to the – to the – to the beat, very well indeed, very good indeed. And … yeah, yeah, good time was had by all, yeah. Beautiful mess silver – the army of course had been there for years and so they had all the silver plate and all beautifully done, yeah. And of course it all got disbanded or wrecked or god knows what happened when partition came along. Anyway I – I suspect the Royal Mountain Artillery regiment went over into the permanent Indian Army and the Indian – many regiments did of course.

Hmmm, well we’ve covered quite a few things there but I’ve got a little set of follow-up questions I’ve been jotting down.

Right, let me shut up a bit.

[Laughs].

Well let’s shut up for two or three minutes and I’ll drink my tea.

[1:02:38]
I was struck a moment ago when you said you’d actually had Indian friends.

Not Indian, Anglo-Indian.

Oh right, sorry.

No, Indians are quite different yet again.

But what’s the difference, I’m quite ignorant about pre-partition India so –

Well if it’s a woman … and they’ve got – appear to have quite light skin, if there is white skin between the fingers then they’re – they – they – English … girls, but if they’ve also got sunburn between the fingers, then that is not sunburn at all, it is their natural habit [ph] and they are not European. And you were strongly discouraged from marrying a local woman, strongly discouraged, and usually it turned out badly anyway. But the – the air force and I suspect the army had a routine for doing – you couldn’t marry without asking your commanding officer’s permission, so an airman would shack up with a – with a local girl and they’d decide, yes, they’d like to get married. And of course it was a terrific feather in the cap of a poor Indian family to capture a – a Brit as a husband and they would go to all sorts of … stratagems to present an image that looked British or at least Anglo-Indian and not native at all. The very black girls, if there were two or three girls in – in a … in the family, the – the very black skinned ones would not – would be kept in the background and not be seen by the young lad who was courting this – this girl that he loved, and so forth. But anyway having decided they wanted to get married then they would go to the – the – the commanding officer and ask for permission to get married and he’d go through the usual routine of asking who she was and how much and so forth and what her background was and so forth, and he’d had been briefed by the station warrant officer and various other people who the girl was and then – so he’d know that she was a local girl and wasn’t … of an English family, and so he … he would try and discourage the lad and if he still said, ‘No, I want to marry this girl,’ then the air force would post him to the other end of the country, just like that [adopts abrupt voice], ‘Bye, off you go,’ ‘No no no no no,’ ‘Off you go,’ ‘Oh,’ ‘Well you can write to her can’t you?’ so that’s what happened. And that was policy, and I think rightly so, I
don’t object to it. [sighs] Hard … there it is. You were going to ask some other questions.

[1:05:41]

Yes, you mentioned visiting Sikhs houses – Sikhs houses a moment ago as well.

Sikhs houses. I’m getting mixed up with some Sikhs I knew later in my life.

Right, okay.

But it’s worth just mentioning that the particular Sikh family that … I’ve had quite a lot of contact with over thirty years was … a diplomatic family where a friend of mine who lives in Winchester had met and she’s a she, she was a … an ambassador’s wife and she met her equivalent Sikh wife of – of a – a – called Singh, they’re all called Singh, and very nice family indeed and what had happened there was that at partition the – one of this – this family, the Sikh man had fallen – fallen on hard times, everybody fell on hard times, no jobs, no anything, and he … was picked out as being bright by … I think an American and – who used him as a … a contact man and that sort of thing and eventually he became … very high up in one of the – starting Air India, the airline and so did very well and that’s how that happened. And I’ve been to their house in Delhi, but that’s far after the events that we’re talking about here.

Hmmm.

[1:07:38]

Did you have many girlfriends when you were in India?

No, only this one, only this one. Well I had two but the other one was literally just a girlfriend, yes. Am I thinking, no no no. And that – I was very lucky, because the great majority of English males, officers or men didn’t have local girlfriends. And also incidentally there was practically, where I was, no prostitution so there wasn’t any female companionship. Delhi was a – a different kettle of fish, but even there the
number of white girls around were pretty small and they – they had the crème-de-la-
crème, you know, they were picked – the … a white girl would probably find herself
the girlfriend of a squadron leader or something before she knew where she was,
yeah.

So were your girlfriends European then or –

I only had this one girlfriend, no no, she was as I said, a Franco-Burmese, yeah, which
was abnormal and was frowned upon, but it was coming towards the end of the – the
RAFs stay in India, well before partition, yeah, and stay in India. And also since as I
explained, I was an officer on my own, I got my own little unit, there weren’t the
same pressures on me as if I’d been a – an officer in the RAF of a much bigger unit,
station there, so that was that, yeah. Little bits of friction which you must imagine;
took her to a … an open night, you know, mess night and she was cut by all the white
women, you know what I mean by cut, cut means didn’t – not there, she’s just not
there, you know, and ignored, put down, sad. That was that. And interesting to see
the reaction of my friends and the other officers, half of them said, ‘Quite right too,
you shouldn’t have brought her,’ and the other half said, ‘That was disgraceful, I was
so sorry that happened, oh I’ve,’ so, you know. I think it would happen in England as
well, or any – any other place that … I – yeah.

What – do you remember what her name – or –

No, well not that I’d put, but anyway, hmmm …

This all sounds a very rigid society in a lot of way, it’s –

Well it was, but the end of the war was smashing it up of course, the – the British
Indian Army officer and Civil Ranks Society was very rigid indeed, very efficient,
very well run.

Hmmm.
And I think there’s a lot of … claptrap of wanting to apologise for our conduct, I think we did the job amazingly well, extremely amazingly well and I think to try and run down the men and generations of the men that served India … was sad, is sad.

[1:10:48]

What were your own views on empire at this time, on the British Empire specifically?

Oh entirely positive, entirely positive. The thought of it being split up and loss of India made me very sad indeed, quite inevitable that it was going to happen, yeah. So yeah.

Hmmm.

[1:11:14]

As – to get back a little more to the technical side of this for a minute, as a sort of technical officer in the RAF, was there any particular connotation carried, how did you get on with normal –

[Laughs] Thank you very much for that word, yes okay [both laugh].

Well, you know, rank and file officers who didn’t have that technical speciality would be a better way of putting it [laughs].

Well the RAF is different from an – a fighting regiment in the army, the RAF’s job is to keep aeroplanes flying, so there are the men that fly the aeroplanes, and the men that keep the aeroplanes running and everything else and there is no problem about that at all. Promotion almost always goes to the – to the people that fly aeroplanes, not the technical officers, or the administrative officers ‘cause there’s administration areas as well, SAO, Station Administrative Officer, very powerful man. No problem, no problem. Of course going back to the UK and a squadron here, then if you have a squadron life then the flying blokes come and go, for all sorts of reasons, they may be killed or posted or what have you, and the – the service people, the engineers and the
signallers and – like me and – they – they stay and are the backbone of the – the squadron for year after year after year, yeah.

_Hmmm._

[1:12:56]

_Hmmm … I think that was the last of my follow-up questions on that [inaud]._

Jolly good. So where have we got to, we’ve got to Delhi.

_We’ve got to Delhi, yes, and I believe you’ve just acquired some leave [laughs]._

Just acquired some leave, I’m just trying to think of anything else to be said about Delhi … that part of India of course the … Japs hadn’t got near, so nothing like air raids or threat of invasion there, that was all over in the Burmese hill, and the Japs didn’t actually get down onto the planes of India as far as I know. The … in the mess in Delhi, which as I explained was a general mess for officers of a certain rank, one officer – army officer happened to be – came into the unit – came in the mess and he was obviously quite different to – he’d just come out of Burma and he was so bloody glad to be alive and it had been such hell that he regarded everybody as you can imagine in the rest of the mess as being just below contempt and yet he had to obey orders, so he – you could say he’d got problems but you could understand why he’d got problems, perhaps it was the rest of us had problems. Anyway, I – he’d … broke all the rules in various ways and – but when it came to punishing him, which should have happened I suppose, no no the – the – the … backed off and he was cautioned every time, so he always got away with it, but I thought it was worth mentioning.

_What sort of rules would these be?_

Oh well one I remember in particular, he had a girlfriend, a lovely woman, and we lived in a whole lot of huts, where own little rooms, about – about a quarter of the size of this – of this – this room here and with your own door out onto a balcony in there, and I remember one night a whole lot of giggling in one of these huts and the – the
loos weren’t in there, there was a separate loo block, so I remember at two in the morning this bloke staggering out completely naked with his girlfriend and they went laughing to this loo block and she went that side and he went that side and back they came again, and he was up on the charge for this of course but nothing again happened. What else to be said? No.

[1:15:34]

*Where were you when VJ Day came?*

In Ambala, where the gentleman put out the barrel of beer free. Great heart that chap had.

*What were your relationships like with your – with your superiors then?*

… Well as I say, I was lucky to – I was running my own unit, so all I had to do was obey … the running rules for – for the mess and so forth. One thing is worth mentioning, I had a driver, and I was very protective of this driver and he was protective of me and we got on extremely well together, and we were driving along and we got into an argument, no physical contact, between one lorry which I was sitting in as the boss and the driver next to me, and another lorry where there was a … a British Army officer. Now of course the army were the pongo’s so they were just beyond contempt, they were down there somewhere, to the RAF this is of course, and this lieutenant in the other [inaud] – the two drivers had had a – a slanging match about something, you didn’t go round this – and then the … the officer said to me and I said to him, somewhat acrimonious words that I thought we were right and so forth and we parted and drove away, and then to my horror next day up before my … group captain, and he explained very … pointedly that I had insulted a senior officer, he was my senior, he was my – he was a flight lieutenant – he was a lieutenant, I was only a flying officer and therefore I – I – he could press charges and I could be court marshalled, and this shook me back somewhat, you know, so … he said, ‘I suggest you have a word with the station warrant officer,’ very skilled old man who ran the whole of an RAF station beneath the officers, if you know what I mean. And he said, ‘Well it’s a difficult situation,’ he said, ‘but the fact you think that the … army
officers are below you really doesn’t count in this case, I would strongly recommend that you write a – an abject letter of apology,’ [adopts shocked voice] ‘What?’ [laughs], ‘Sir I’m just trying to help, I’ve seen these cases before, what else do you think is going to happen, we don’t want you on a – on a charge, we don’t want a – a court marshal, that can only cause friction between the services, we must find a way of doing it, and the way is Sir for you to abjectly apologise,’ he said, ‘it just so happens I’ve written out a suitable letter,’ [laughs] and I read this through and he said – and I said, ‘All right,’ so he said, ‘Well would you like to write it out Sir and let me have it,’ and so this happened and it – it all disappeared, but it made me think, you know, I was a cocky little bastard and I should have known better but I just – anyway, hey ho.

[Laughs].

[1:19:12]

How did you feel about the end of the war?

Oh that’s some way away after that. Well no, that’s at the – that’s where the end of the war was, I’m so sorry, getting out of the forces is what I thought you meant. Well the … the reaction you would normally expect, great relief and what have you. And a desire to get out of the air force and get back into civilian life, which if I hadn’t won the mid tour leave would have been two or three years away and – and a very serious – well would it – who knows what would have happened, but I certainly would have had more difficulty. I think I would have been allowed to go and take a further degree and there would – that would have happened, but there were – that would be two years back – further back in the queue for jobs and that sort of thing, ‘cause of obviously the first guys out had the better chances of jobs. Let’s think, something – anything else to be said about the end of the war … did I hate the Germans and the Japanese, yes, completely and absolutely, yes. And that’s still with me to a certain extent and it’s one of those things you won’t grow out of, I’ve got German friends and got on well with them, but I just cannot forgive what – what they did to us and particularly as of course to – to the Jews and the gypsies, it – it – it’s difficult to say, well the good Germans and the bad Germans, which is which [laughs], yes, so there
we are. So I still have … I apologise – or should I apologise, no, it’s how I feel and that’s how I’m going to be, yeah, there we are, but I’ll still be dead – soon be dead so that’s all right. So the next generation come and do it all over again. [sighs]

[1:21:12]

*Other than this bottle of beer on the middle of – barrel – barrel of beer in the middle of the runway* [laughs] *were there any other celebrations or was that it?*

Oh yes, of course, of course in the messes and that sort of thing, yes, the boys had – but [laughs] it was – just a demonstration that the – the group captain had to do something to show that the war was over and so forth. Sort of thing. One little bit of service routine if you like and that is if you have a – an article of clothing, take a greatcoat, nice piece of – of thing … to have it replaced it’s got to be worn out and somebody has to certify that it’s worn out, that, you know, the threads have gone and so forth, and I'm not thinking of officers ‘cause they’re responsible for their own clothes, but warrant officers are kitted out by the RAF and there was – if you wanted to get a piece of equipment condemned and written off without going through the usual channels, then only a group captain or above can sign off real money, if you understand, like a – like a – a greatcoat. And there was a warrant officer in – in one … posting I was at who’d dunked his whole … greatcoat, lovely greatcoat in a cleaning fluid, rather like petrol to get stains out of it and that sort of thing. Unfortunately when it came out it was a light mauve colour where it should have been RAF blue and of course the – and he was a warrant officer, I mean wasn’t high rank and so something had to be done about this, but so the only – there was a group captain visiting the RAF station and so he requested permission to apply for a write-off of his mauve greatcoat, so he – he paraded in front of this – this – write-off greatcoat agreed and that was done, so there was a system for coping with curious occasions.

[1:23:30 onwards].

*Hmm … so –*
Well we’re still – we’re still in India aren’t we?

_We’re still in India, yes, and –_

And a pity to leave India without –

_And you’re still on leave [laughs]._

Oh, another little thing that happened, I think I may have said this before, about the little aeroplanes? No. In this station of Ambala which is right in the middle of nowhere, flat flat flat flat plains for miles and I wasn’t … I was – though I was in the mess, otherwise I was completely separate from the – to the people that were flying aeroplanes and using it as an aerodrome and one day a little aeroplane appeared in the clouds, a little monoplane, single engine, buzzed round and landed and another and another, and about forty or fifty of these little aeroplanes came and landed on – on our aerodrome and their officers came into our mess in the evening, had a boon, and off they went again next day. We were delivering a batch of these little light aeroplanes to the Chinese, who were fighting on our side against the Japanese, and there was a thing called – what was it called, the something Highway, Burma Highway I think it was, that went over between the – the top of Burma and – and China, and it also was called the Hump and these little aeroplanes, god help them, were going to fly over the hump to deliver to China, which I should think they must have tried to get up to something like – to 15,000, 20,000 feet, incredible for little aeroplanes. So it was interesting, just a little wave of aeroplanes passing through … I’m trying to think of anything more to say about the end of the war, no, I – I don’t think there’s very much to say.

[1:25:19]

Though – ah, another thing to be said was the things that isn’t – doesn’t often appear in print, that because of the desire to be demobbed there was demob riots, no, is that – would it be a riot, by I mean – I – they didn’t use force or anything like that, they – a group of people, several hundred, would meet in a hangar at night, completely dark, people would put bits of paper in their mouths [makes mumbling sound] to decide
what to do, and two or three stations in – initials at – this was mutiny, it really was, well it is a very serious thing, and but yet it was – tried to do it in a very gentlemanly way and a sensible way and often the people who were spearheading this were – were sensible moderate men, and – but it – under no circumstances can the armed forces tolerate any sort of mutiny, it just cannot be – whatever, however – what’s the word I want, valid the – the points are. So what used to happen is the hard lads used to be brought in to interrogate these chaps and they just disappeared, they were taken away, god knows what happened to them, yeah. I suspect they were court marshalled somewhere and put in prison somewhere, goodness knows, but it was all broken up and – I don’t think you read – read about … forces don’t like a record of mutiny, not a very good thing to have, but there were some RAF mutiny’s on certain RAF stations in India, ‘cause it was hot and sticky and they didn’t know when the hell they were going to get home and all the other things.

Were – did this happen in any of the stations – any of the places where you were placed?

No, not as far as I know, no. And there wasn’t any feeling about that. Well, how would I know, how would I know, I was an – an officer, no, I wouldn’t know about that. No no no. I – certainly, there was a lot of feeling about our lads wanting to go home, and – and having to wait because there were sorts of lists that came on month after month that this group of people will be due for demob at this time, yeah. That – that put more emotional charge into the situation than when we were fighting, yes, ‘cause people understood what it was about then.

[1:27:59]

So how did you win this lottery?

Say again?

How did you win this lottery with the leave?
Don’t know, one of these sort of things, you know, you’ve won mid tour leave, yeah, just like that. I don’t remember actually applying for it.

[1:28:13]

Did I talk about being court marshalled for the loss of revolvers?

No.

Oh right, okay, let’s have a go at that one. Two things … first of all I was talking about there’s always a system for doing something, to get round things. At the end of the war, you say what happened, one of the things was that … every time … an officer in charge of a unit who signs and is responsible for all the equipment in that unit, hands it over to the next officer, there’s the hurdle of getting him to sign the – the list that said all the bits are there, the telephones, the – the cabinets, the everything. And you are supposed to do equipment checks and in the middle of the war, not necessarily they were done, there was a much more free and easy, but come peace and the … RAF accountancy people would checklist much more seriously and when I came to hand over my responsibility for my unit, everything was all there except a watch, timepiece, stopwatch and it says something like, ‘One watch, various,’ or some – some term, I don’t know really, and I couldn’t find this watch and … so, again, warrant officer very helpful, they’d been in the service a long time and can advise poor little ignorant officers what to do and he said, ‘Watch Sir?’ and I said, ‘Yes,’ he said, ‘Well what sort of watch Sir?’ ‘It just says watch,’ ‘Oh does it now, so does it say if it’s going or not going?’ ‘No, it just says watch,’ [laughs] so he said, ‘Well Sir I should go down the bizarre and see what you can find,’ so I went down to the bizarre to – junk stalls with all this rubbish over here and try to find a watch and the bloke said, ‘Very good watch,’ he said, ‘it keeps beautiful time, listen tick tick tick tick,’ ‘I don’t want it, I don’t want it,’ ‘Don’t want the watch to go Sir?’ I said, ‘No, I just want any old rubbishy watch,’ ‘Oh Sir,’ he said, ‘no, no, no,’ so anyway I – obviously I found a watch that – that was not working and downmarket and I paid ten bob for this and took it back and said, ‘I’ve found that watch,’ warrant officer said, ‘Could I see it Sir? That’ll do nicely Sir,’ so that was that, and of course – and it went straight in the bin, unserviceable watch, not worth repairing, straight in the bin, so it
was purely to get – keep the system going. But the much more serious thing was this that I – I ran this signals school – signals transmitting place where there were rows of men who sat in front of their desks with wireless sets and – and Morse keys sending messages backwards and forwards, and in order to get some security from this there was a revolver in the drawer and every – and with some ammunition, and so every time a watch took over, and there were three watches on a – in a day, one watch keeper would sign, arms and ammunition correct, arms and ammunition correct, and so forth, and so come the end of the war it transpired that there was a list somewhere else that said the arms consisted of two revolvers and ammunition and now there was only one revolver, so we had a – and that was me in charge, obviously arms very important, so I was responsible and it really was a court marshal offence to lose a – a firearm. So – and I had never seen more than one revolver and all the people in the – who I talked to had never seen more than one – that was no point – that was not the point, I was responsible now and there had been two revolvers and you hadn’t [inaud].

So I was in the firing line and again this took the wisdom of old – old lag non-commissioned warrant officer to sort out. He said, ‘Yes Sir, well they’ll have to get a court marshal together won’t they?’ I said, ‘Yes, they will,’ and he said, ‘Well you’re a flying officer now aren’t you?’ ‘Yes yes yes yes,’ ‘Okay, well that means that the rank of the people on the court marshal will probably have to be squadron leaders to –,’ do this sort of thing, he said – he said, ‘Yes, and let me think,’ he said, ‘well I think we need three officers, three squadron leaders,’ I said, ‘Look, you’re taking as though we’re going to –’ ‘Bear with me a moment Sir,’ he said, ‘What’s happening at the moment Sir?’ ‘Well everything’s falling to bits, people are going all –,’ ‘Yes, that’s absolutely right, so it’s going to be difficult to get together three squadron leaders at three months notice that are going to be there to hold the court marshal,’ and I said, ‘Yes I suppose it is,’ and he says, ‘Well let’s work on it that way shall we Sir?’ he said – he said, ‘The – nobody wants this court marshal and everybody is on your side but the system says this,’ he says, ‘I suspect we will be able to arrange it that people are selected to go on this court marshal who are just about to be sent home for demob so they won’t be able to serve and somebody else will have to be found,’ I said, ‘But,’ ‘Leave it to me Sir, just – just leave it to me,’ he said, ‘I understand your – your anxiety about this but I think that in the end they will just find that it is not worth pursuing,’ I said, ‘Well can I move about?’ ‘Oh yes,’ he said, ‘nothing’s going to stop you going on mid,’ – well he didn’t know about mid term leave then, he said, ‘Oh no
no,’ so I never ever heard anything more about it, but again there are always ways of – of adjusting this, how this revolver disappeared goodness only knows, but there we are [laughs].

*So you never had to go into the court marshal?*

No no no, never heard another word about it, not a word about it, no. See nobody wanted the system to charge into this what seemed to be irreversible decision that, yes, must be, no excuse whatsoever for losing a firearm. Anyway, there we are. But …

*Your – your warrant officer sounds a fascinating [laughs] –*

Well he wasn’t just one warrant officer, almost always the – the station warrant officer is a – a very skilled old serving man, forties perhaps, seen it all before, yes. Very helpful if approached in the right mood. Yeah.

*Hmmm.*

[1:35:22]

*What were your relations like between you and your men?*

No problem whatsoever, no, got on very well with them at all. They were all – mostly civilian, who had been civilian men, so one – a few of them as I say were old time serving RAF caps, so also extremely useful because they’d seen it all before, yes. No, I … on the whole the – almost all the people I dealt with in – in the RAF were – were companionable and got on well with them and no problems at all, yes, yes. Very much so.

[1:35:58]

*You mentioned quite near the start of this session about how you – your – your radio station got shut down by insects [laughs] one time.*
Yes yes yes.

Were there any other – or – or similar technical problems you had to deal with?

Well no, not a technical problem, but you were asking about how I got on with my men.

Hmmm hmm.

And we were talking about the blokes who had been jilted by their girlfriends and received a letter, and I’m trying to think what the name, there’s a – there was a –

Dear John?

Yeah, yeah, Dear John. Well that’s the American term, there’s a British one, equivalent to a Dear John letter. One of my chaps was in a terrible state and he’d got one, he was suicidal and we had an occasion where we had these great big aeromasts with steps up the side and he was climbing up there to throw himself off and I can’t – forget how it was done, but anyway he was persuaded to come down and there was no trouble, but I don’t think you can really call that a technical problem [laughs]. On the whole the equipment worked well, there was never any desperate panic on equipment that failed. No, no.

What sort of equipment would fail then?

Well, the transmitting and receiving apparatus, oh and – and the landlines between them and, yeah, telephones and all the things you needed to – to keep something going, yes. But yes, it all worked reasonably well. RAF equipment divided into two sorts, that which had been designed long before the war by a very ponderous … method of – of designing and accepting equipment that was highly stamped and usually dated, and then the war came along and what happened, the – there was a need for a vast acceleration in the development of new and – equipment and British civilian companies, particularly EMI and Marconi, produced equipment far far far better than
the RAF were using which was – the RAF actually had wireless sets where when you had a component like a resistor, you couldn’t just solder that resistor in, oh no, it had to be a mechanical joint as well, so the end of the resistor had to have a tag put on it which was soldered and brazed on and put down under two nuts and bolts. Now you just couldn’t run a war like that, but this sort of existence which had been evolved by the technical services in the RAF from – in civilian life was suddenly swept out of the way by this other equipment which was far more … higher frequency, higher performance than – than the stuff that the RAF had developed for itself. And there was – not in my time, but just before I got in, terrific rows of course, could we accept this stuff that didn’t bolt down and that sort of rubbish, really that … but then it did.

And of course the same rows are now going on, these tour buggers that are being blown up in their Land Rovers because the equipment has taken too long to order, and has to be too precise and gone through too many checks, when it – take this business of looking for landmines with detectors, you could probably go down to a shop and buy a metal detector and ship it out and it would do this, but oh no, the armed forces couldn’t possibly have that, it would have to go through a whole series of tests; can it work at the North Pole, can it work at the Equator, is there a manual with it, where are the spares, all that sort of bolly-hoo-ha so people get themselves slaughtered because people won’t take a shortcut and just go and buy things. Anyway, there we are, ’twas ever thus.

[Laughs] Shall we take a short break for a second?

Yeah, and I’ll –

[End of Track 5]
Raymond Bird, interview March 2nd 2010. I think at the end of the first interview we’d just reached the point where you’d won lottery leave, or leave... [ph].

Yeah. To – to come home to England from India in the middle of the war, absolutely right. Well end of the war it was actually. Right, so go down to Bombay, wait for a ship and luckily this was delayed because it was full of other people who’d got to go home more early, but I struck really lucky on that ship because it was another liner, it – it was the … there again, short term memory gone to bugger, it wasn’t the Capetown Castle, it was the Strath – Stratheden, the Strathline and a beautiful ship again, but this time it was half empty and the people going home on it were officers like myself and also families of people that had been marooned in India during the war who were going home, so this meant that a lot – quite a number of nubile young ladies on board, which was a good thing for a man that had been in India with – where nubile young ladies of the right colour were nubious – were short supply. So, very grand trip home, met a very nice girl there, absolutely sweet girl indeed and we got on very well and her parents had got a cabin near the stern of the ship and they used to sleep out on the deck at night, and I was terribly embarrassed because this girl was getting terribly intense and sort of, ‘When shall we get married?’ and this really bleh-bleh-bleh-bleh, that just hadn’t really crossed my mind [laughs], so I – I thought, well I’d better have a word with her mother, so they were half asleep out on this deck early in the morning so I went and said, ‘Could I just have a quick …?’ ‘Yes, sure you can talk to me, yes,’ I said – and I said, ‘I love your daughter very much, she’s a real sweetie, but she’s – she’s getting very intense,’ and she said, ‘Don’t worry, she always does,’ shut her eyes and went – went to sleep again [both laugh], so that was all right. Another thing that was out of interest of that, was at the stern of the ship there was a little mess of some of the people that sailed the ship, I’ve forgotten what their duties were but they had this little mess of – all of their own and they said,
‘Come in and have a meal,’ so I had a meal on a table like this, about eight of round it, knives, forks, spoons, plates, all the things on the table, good meal and at the end of the meal they said, ‘Irons off,’ and they moved – you took all the metal stuff off and put it on the table, then they took the corners of the tablecloth, took them together, took them to the rail of the ship and threw them overboard, no washing-up, no anything, everything went; the crockery, all the bits of food, just whoosh, salt pepper, all of it went. And I said, ‘But-but-but-but,’ and I said, ‘look at all that,’ he said, ‘Brother you should see what it’s like in a storm,’ [laughs] in other words what we’d thrown overboard was absolutely nothing compared with the wreckage that happens when there’s a storm. Anyway, I just thought I’d mention that. So that was that. So the ship that – the sail home was gorgeous, lovely. The other interesting thing was that there were quite a number of Anglo-Indian girls going home, coloured ladies, with – with their new husbands or what have you, and there was something about the cold damp grey light of England that took the shine off them, they looked lovely under the tropical sun of India, but how they ever got on in England afterwards I have no idea, but it – they – the sparkle went, which was a shame, they were just out of their – their environment. So what else to be said about the – this – the Stratheden coming home. Not really much, that was just a very pleasant journey.

Were you looking forward to coming back?

Oh yes, of course so, and got – so got back home … posted of course – sorry, first of all leave, during the leave I went to Imperial College … London, to the electrical engineering department and said – I was in uniform, ‘I’m home on mid tour leave, could I please see the professor?’ ‘Yeah, sure,’ so I went in to see a man called Professor Willis Jackson, good chap and said, ‘Look, this is my situation, I’d like to take a PhD after the war,’ he said, ‘Well yes, yes, no trouble about that,’ I said, you know, ‘Can I sign up with you?’ he said, ‘Yes sure, surely you can,’ ‘But I’m going back to India,’ ‘Oh that seems a – a shame, you – you can – I can get you released,’ ‘You can? Ooh,’ ‘No problem at all,’ ‘The – the term starts in October – September,’ and it was about June I think this was, ‘Yes, you needn’t go back,’ ‘What do I have to do?’ ‘Nothing at all,’ he said, ‘I’ll make sure that happens, if you leave your name with my secretary and so forth,’ and so I got to this lovely situation where after a few months in the RAF I was out and at Imperial College.
But then the – the … the bad bits start. He – first thing was he said, ‘Well look you’ve been in the RAF for three years, you need a refresher course, I think you better take the last year of the degree course again,’ and I thought – I said, ‘All right Sir,’ and so I did you see, so signed up for that, and it was – the – the teaching standard at – at Imperial College wasn’t that good, it was worse than at Woolwich Polytechnic and I wasn’t learning things that I didn’t already know so it really was a – a bad decision on Willis Jackson’s part. And then the next bloke came, he said, ‘Oh by the way,’ he said, ‘I’ve decided that two years for a PhD is too short, it should be three,’ and I said, ‘But Sir, I’ve just taken one year on this thing and, you know, I’m twenty-four, twenty-five, I’ve got to get out there and I’m nearly married, I’ve got to do something about this,’ and he said, ‘Well three years it is,’ and I said, ‘Well what can we do?’ and he said, ‘Well you can take an MSc in one year,’ so that’s what I – I was downgraded from an MS – from a PhD into – to an MSc, which actually was a great shame because the research I was doing, if it – if I had been allowed to do two years it would have been much more fruitful in the end, so I took my year’s leave – refresher and then after that started on an MSc. I was … my – what do you call it, the chap that directs you?

 Supervisor?

Supervisor, good word, was a bloke called Dr Lamb, Dr John Lamb who was a young chap like me, but probably five years older than me, and he was … looking into the absorption of ultrasonic waves in liquids with frequency, what happened to the absorption and there’s a little formulation that should – absorption speed – proportion to the square of the frequency or something like that. But some liquids, when you measure the attenuation of ultrasonic waves through them at various frequencies, at one particular resonant frequency the waves – the – the attenuation shoots right up and this is due to a molecular clump in the atom, say a CH3 group oscillating against the main thing, so you could deduce something about the structure and the energy of the structure of the molecule from the absorption of ultrasonics. So that’s – but my job essentially was not the physics, it was to set up the apparatus that would do the
measuring of this, by pulse techniques you see. Though I hadn’t been a radar officer … it was no problem anyway, so they had – at the end of the war all sorts of technical equipment from the services was given to the teaching profession to see if they could make use of it and I needed a – a radar transistor and a radar receiver to – to build this and they found me some lovely … navy equipment … over engineered and as heavy as hell, but beautiful, absolutely lovely, and so I was given this to modify and that was great fun, it really was, because again I was the only one that knew and it’s always lovely to be in a situation where you’re the expert, whether you are or you’re not. So I had this radar set, was tapping into it, looking at all the wave forms with an oscilloscope, deciding what to do with it and absolutely – so – and also the apparatus for measuring the ultrasonic transmission had to be designed. I haven’t said, but the liquid chosen to measure this end was ascetic acid, which as you know stinks like hell and is like a chip – fish and chip shop, well vinegar, and so I – at that time I was courting my wife so I didn’t smell very well, so … this apparatus consisted of a long tank with a moveable head on a … a lathe bed which you can wind a handle and things move up and down on it, one of the – the transmitting heads would be fixed and the receiving head would move up and down this tank, so you could get different lengths of transmission parts. There’s a – no – a whole lot of stories about why you’re doing that but we won’t go into that for the moment. So two crystal holders had to be designed which had to be waterproof so you could get a contact on the back of – of the crystal, and put a pulse down to send it through the – the liquid and another crystal where you received the – the ‘ping’ as the thing went through the liquid, and then you had to measure the strength of it.

What sort of crystals were these –

The crystals would be quartz crystals. No problem, you would order them, I want a crystal like this of such and such a thickness, such and such a frequency, so you had – ah, another thing to be said; there was a man in the computer industry who became quite famous later, called Dr John Pinkerton and there was a piece of paper in there that you saw just on that – Pinkerton, and he was older than me and he wasn’t – he was a PhD already and he was – got his own department or he was let loose at Cavendish, he was – and it so turned that he was doing this at Cavendish at the same time as John Lamb and I were doing at Imperial. So John Lamb and Pinkerton got
together and they split – very sensibly they split the frequency range, so my frequency range was one and a half megs up to ten and his was ten megs and above, so – so I met him often and we got on quite well together … the apparatus was my job, so I got all these various bits of electronics and joined them together and made them do the job, and it was highly successful and I got my MSc thesis you can look at Imperial College if you want to – sorry at the university library you can, Absorption of Ultrasonics in Ascetic Acid. So I had a year of doing that.

[12:34]

In the basement of City and Guilds which was in a hell of a state, it was as filthy as hell, we [laughs] – we thought we’d shame the professor into spending some money on this, the – the grime was the walls was absolutely terrible, so we very carefully cleaned the walls, except for a picture of a bucket and a – and a swab in a frame, and we asked him down and we said to him, ‘What do you think of that picture?’ he said, ‘Well somebody did a very good job drawing that didn’t they?’ and we said, ‘Have a look at bit closer,’ [laughs] you know, he said, ‘No it isn’t?’ I said, ‘Yes it is,’ so we did get out lab cleared. So that was that.

[Laughs]. Can you describe the lab to me?

The what?

Can you describe the laboratory where you worked in the –

Oh yes, about twice as big as this room, down – with windows looking up to the – the pedestrians that walked along … what’s, Exhibition Road, that slopes down past City and Guilds. City and Guild was again – was a nice place to – to work in, again hadn’t has as much money spent on its electronics and its support as it – it might have, well there’d been a war I suppose, that’s one of the reasons. For instance, at that date which would have been 1947 I would think, by then, I couldn’t – don’t – don’t take that for granted but it would be about then, in order to do the … copying of drawings to go in my thesis that the – the sketches of the apparatus and the graphs and the curves, to get more copies of that we had to use a limelight, have you ever heard of a
limelight? Limelight is an electrical discharge between a lime, calcium oxide and is extremely bright and it’s what they used to use in cinemas and – no, particularly in – in theatres, people used to go into the limelight, it was the – the floods and the – the spotlights that was used. So anyway, a cylinder, six feet high I suppose – four feet high, three feet in diameter, glass, you took your drawing along and you put it against this cylinder and there was a – a jacket or canvas cover that went over the drawing and a strap that went round and then the limelight … you put the paper you wanted to copy behind what you were trying to copy, so it had to transmit through it which was a bad thing, so you – and so the limelight shone through the paper onto the thing behind, same way as you would do a photographic thing, and the – the limelight itself was on a chain with a – a fan that made it work slowly and move gradually up there once you’ve lit – you’d struck the arc and got it going and this copied onto there. Now, I’m trying to think was there a developing process, I don’t think there was, somehow it did it automatically. Anyways, but just shows how old fashioned the place was. So I had two good years at Imperial, got my thesis no problem, got my degree through no problem.

[16:07]

What was your relationship like with your supervisor?

Excellent ‘cause he never appeared. Not being rude to him, John Lamb, no, just … again I’m a self-starter and he hadn’t any idea about pulse techniques or what I was doing and as long as I just got on with it and did – did what was necessary. I mean he was fully supportive, there was no – got nothing against him at all, just that yeah, because he was interested in the physics of the resonance of the molecules, which meant nothing to me, I was interested in the technique of making the measurement and setting up the apparatus to do that. Which we did.

[16:49]

So how did you actually go about taking this naval radar and turning it into a scientific instrument?
[Laughs].

*You know, it seems a big jump from something that you point at ships to lab equipment, it's –*

No no no, it's because I'm an engineer and I will engineer to my fingertips and as a boy I'd been messing about and making things and seeing what I could – making trolleys and this – so it all makes a – an attitude of mind of can do, what can I do with this, how can I make it do that. No, you first of all get a bit of paper and you put a block which says transmitter and another block that says receiver, and then you think, yeah, but then how am I going to measure the strength of what comes out, so then you put another block in which says attenuator which is a – a thing that – well attenuates and makes things less powerful, but it is a calibrated instrument, so you kept the receiver at a constant gain and reduced the output by the attenuator to a constant figure and then if you read off what the attenuator figure is, it is a compliment of the power going in, am I making sense?

*Hmmm hmm.*

So in other words, if the gain was ten in – in the – in the receiver, and you attenuate it down to a tenth, then if you only transmit one into the receiver, then only one will come out, and so to get it up to ten again, you have to reduce the attenuation on the attenuator to make the whole thing balance, so it wasn't a meter on the output you read, it was you – you alter the attenuation on the attenuator to – to balance the strength of the – the receiver signal. No, I –

*Hmmm, so just –*

You were looking worried.

*I'm just – so what sort of display is at the end result of this then if not a meter?*

No, it wasn’t in that case, it was a reading of the – the numbers on the attenuation, twenty-seven, 264.
Oh right, okay.

Whatever it was, yeah.

Okay.

Yeah, but it could have been a meter. But yeah, but attenuator is more accurate than a meter.

Hmmm. And this – was this radar or sonar equipment?

… Good question … good question. I think it must have been a water borne radar equipment, a water borne radar transmitter, yes it undoubt – well no no, no I think it was a radar transmitter for use on a ship, not a sonar. But it’s a very good question, it could have been a sonar set which is doing exactly the same thing, because you were thinking of sonar was transmitting through water, but no way have I got any of that part of the apparatus, all I got was a big set with an input … and a display which you could see the pulses of how long something’s taken before it goes that [inaud], and a transmitter. And then I had to make a – a receiver quite separately, and you could buy things – acquire things called IF Strips, Intermediate Frequency Strips which are a whole series of tune circuits, of all one fixed frequency, say a megabyte – megacycle, and so you could possibly put in one microvolt there and get a volt out the end a million times gain in this thing, and it’s a set thing and you don’t have to twiddle any knobs. So if the frequency I was transmitting was the same as this thing, no problem at all, just the higher frequency. And I cannot remember now, and I could go and look at my thing, whether they had a whole different series of IF Strips for the different frequencies I used, or whether I had a – what’s called a frequency changer in front, which supposing I was trying to get three – I was trying to receive three megacycles, and I wanted to get one megacycle into my IF Strip, then I had a frequency changer which changed from three megacycles down to one megacycle, which would be a – a beat for instance. Anyway, so yes, there would be a receiver and that would go after the crystal at the far end of the – of the tank. The tank was also surrounded with liquid because you wanted – water I meant in this case, ‘cause
you wanted to take frequencies at various temperatures, so you’d do it at a – ten, twenty, thirty, forty degrees centigrade, and the – the smell from the ascetic acid got worse as you heated it up. So good time, yes, excellent.

_So when you got this equipment then from the navy, was there any documentation with it or –_

No no.

_Did it just turn up [laughs]?

No no no. No … you … you knew what has got to be in there logically, so there was a bit of poking some volts in here and seeing what happens sort of business but it was a relatively simple piece of apparatus, and yes you could deduce what you wanted from it, yes. All sorts of bits around it you didn’t ever use, it was just this – oh presumably something to do with lighting or other frequencies or receivers or some – this box, I wanted it purely as a transmitter where you could ping it and out would come a high power pulse, which we put on the crystal and away it went.

_Hmmm … so you had no technical documentation before – and was there anything else you read along the way to help you –_

… Not that I can remember. Not that I can remember. No, I think most of my previous training in the RAF and as a – as a – an amateur radio chap before the war was enough yes. No, I can’t remember anything other than you couldn’t just deduce and do, yeah.

_Hmmm._

[23:02]

_You mentioned briefly last time that you’d been impressed at the end of the war when the news about radar came out?_
Yes, yes, very much so.

*Can you tell me a little more about that?*

Surely. Because there was this great backlog of knowledge in the armed forces and in – above all in the – in the civilian organisations like TRE and RAE and all those service civilian organisations to publish all that had happened, or what was allowed to be happened, let’s put it that way. So there was a great … conference at the IEE in London where a great list of papers on all the radar subjects with their – their names, you know, like H2S, Oboe, Decca, all those sorts of things were – people gave papers on and those papers were – were a joy to read because it – one’s eyes opened, one saw what had been done and what was possible, yes. Absolutely, very very impressive.

*What in particular impressed you, was there anything that stands out?*

… Various techniques of using pulses to doing all sorts of things, delaying and turning them upside-down, merging them – all yes, just general pulse technology. And of course … this information became very useful later in designing the first computer under Booth for – so yes, that all – all came in beautifully. Pulse techniques, it came as a great surprise to people that weren’t knowledgeable on radar, that you would waste a valve just turning it on or off, valves when I’d been young had been used for amplifying things and, you know, doing much more than just on and off, what a waste of a valve doing on and off, but that’s all computers were, masses of valves being turned on and off, yeah.

*Hmmm. So had you had any idea about the existence of radar at all when you were a technical officer?*

You could jolly – nearly say zero. The – the aircraft when I was in – before I went out to India I was service – in charge of servicing aircraft, were – mosquito aircraft training Poles to fly and navigate and they had radar in them as well as radio, and I was responsible for the radio equipment and the radar officer who was a colleague of mine and in the mess and that sort of thing, he was responsible for the radar equipment, but we never asked – never asked him what he did because – well you – it
was – he shouldn’t tell you and it would be a – a stupid thing to have that knowledge, you don’t want to have knowledge of things that can get you into trouble [both laugh].

*So you’d had no idea what – what the radar – what – well what I know now as a radar set on the front of a mosquito, you know, it’s got an aerial pointing out or a bulbous nose cone, you had no idea what it was for at all?*

No, not really, not in – in what it actually did in life, I mean yes you knew it was something to do with the bombing or something – fighting – shooting down other aircraft of course, yes, but no, I never saw it work or looked at it. And there was a thing called – obviously the … what’s it called, the something Secrets Act.

*Official Secrets Act.*

Official Secrets Act, which applied very strongly and rightly so, under such circumstances you don’t go and try and gain knowledge of something you shouldn’t know about, ‘cause you’re making your vulnerable, yeah.

*Did secrecy come into your work anywhere else?*

Oh yes … again when I was in … running trans – receiving and transmitting stations were sending messages everywhere, almost all these messages were in cipher, so what you got out of the receiver you couldn’t read it, it was then shipping through a hole in the wall to the cipher office who dealt with it. So that, we transmitting people, except for the topping and tailing of messages, ‘Hello Joe, how are you, I’m off,’ sort of – not quite like that but, you know, the chit-chat to get your – your – set up, but once you started to transmit the message, then it was just groups of figures and you hadn't a clue what it was, just got to get the right number of groups through, perhaps it was a 379 group message and if you’d got 378 something had gone wrong hadn’t it, sort of.

*Hmmm. Your work with ultrasonic pulses in liquids, that – was there any connection there as well with delay line memory on computers?*
No, didn’t know anything about them at the time, nothing at all. But yes, you’re quite right, there are – analogous, except one wasn’t using the – the transmission to store anything, no, not to store anything, no.

*So it was just a way of analysing the liquid between the two?*

Yes.

*S hmmmm …*

[28:35]

*Where did you hope that the MSc would take you, was there any sort of end point in mind or –*

I wanted to go into research, whatever the hell that was. And that was my aim, and in fact having got my MSc I then went for interviews and it was the usual – usual culprits, it would have been GEC, Metro Vic, English Electric I think were the three I went for interviews with, and eventually landed up at GEC Research Laboratories Wembley which was a – again an eye open – terrific laboratories, acres of it, beautifully set up with all the things you need, supplies and support services, workshops and so on, and different departments dealing with different things. And I was in the vacuum tube – delete tubes, that word did – that was an Americanism, valves, connected with the … Marconi valve company which was part of GEC who had their works at Hammersmith.

[29:46]

And … by that time I was married, I’d – had met my wife Dora, when we were both … living in digs near Paddington, just by Paddington Railway Station and she was … a hospital technician in the research section of Hammersmith Hospital, [sighs] and I’m trying to think what the name of the research area at the Hammersmith Hospital was, but it was something like the Royal College of Physicians – I can’t remember, anyway, but there were – so she was doing work supporting a doctor who was doing
research on sickle cell anaemia which is particularly biased I think to ... Negros in Africa somewhere, there is a hot bed of it, it means that certain cells are sickle cells, red cells. So she was doing that.

How did you meet her?

In – I was in the same digs. Digs in – digs ... where –

Sorry, where were you living then?

In Hammersmith – sorry ... near Paddington Station, just down from Paddington Station, one of these – these huge Victorian five storey buildings, all split up into digs and – with breakfast room downstairs and you cooked your own meals on gas rings up the building and I shared my room with – with another chap right at the very top, who was a nutter. One night the paper that the ... butter was wrapped in caught fire in the waste paper bin, so he took it and put it on the parapet and said, ‘That’ll be all right there,’ [laughs] the bloody police and the fire engine were – [laughs]. Anyway, a nice digs, a whole lot of different people in there, a good time was had on the whole, yes yes. Out of interest, one of the chaps that came to live in the digs was from the communist part of Czechoslovakia, he’d been sent over here for some reason and only then did I realise what communist brainwashing did to people; he didn’t mix, couldn’t mix in, wasn’t allowed to mix in, felt highly vulnerable in the fleshpots of the west where money was available and people talked to each other freely, he was completely clammed up. There was no humour in him at all, most disagreeable chap. Anyway, I just thought that – well, but he was obviously terrifically brainwashed and allowed to come over to this country to do this because he’d been brainwashed and wouldn’t liaise with these apparently opulent, lots of money, terribly capitalists. Yeah, shame isn’t it? It took some years before they got broken up didn’t it? Dear oh dear.

[33:15]

How did it look at the other end of the spectrum, the Soviet Union was on the right in the late ‘40s?
… The – all through the war there was terrific admiration for what the Soviet Union had been doing, but nevertheless a great feeling that they were different, that they were a different sort of animal from a different part of the forest and look out, there was no feeling of terrific comradeship with them, which there was of course with the Americans or the Australians or the New Zealanders or the French or all the other people that worked for us, with us, and the free Poles of course [sighs], oh those poor free Poles, that was very very sad. Very sad. Very very sad …

_Hmmm._

[34:14]

_I was just wondering what were your own political leanings at the time?_

I’ve always been apolitical, I have not been in any way stimulated to go into politics or have any great feeling for politics. I’ve always think – thought it was rather a self serving dirty game, but that’s just personal. But necessary, necessary.

_Hmmm._

Like journalists, you know, going to have a free country you’ve got to have those bastards, yes.

_[Laughs] Hmmm._

[34:49]

_So you met your wife in – in your digs then?_

Digs, that’s right, absolutely. What’s to be said about that? Oh just we got on very well together and her – her father was a Methodist minister in Eastbourne, visited him, got on well with him, bit – I was an Atheist so he was pretty – pretty upset about that but he took it well and he – I think he saw that his daughter was going to be looked after and have a bloke that would bring some money in and was stable and so
it was all right, yeah. He was on the whole a good chap, good chap. But I had never been religious at all and it was very interesting to be exposed to the Methodist Church, he was a Methodist and he was – he was what’s called a superintendent, which is a sort of sub bishop sort of chap and the Methodists were very tight together, tight people, they supported their minister very strongly, there was a – a great – well support is the word for the – for the church from the strong Methodists, who were mostly tradesmen, they were – greatly appealed [ph] to people who in business in various ways. And in Eastbourne there were a whole number of schools and colleges and things like that associated with the Methodist Church which he had a relationship with. Good chap, yeah.

**Hmmm. What was your wife like?**

My life?

**Your wife?**

[Laughs] What was my life – wife like? Intelligent, very kindly, sweet nature, it – strangely, like me, she was also experimental, she liked mastering some physical technique and having done that move on, so during our marriage she did all sorts of things, dressmaking, spinning, weaving, dying, beekeeping, goat breeding, that’s about – that’s enough I can think of at the moment, but – oh learning French, you know, and so on. She … was like me self-motivated, a self-starter is the phrase, yeah, and she was a super wife, a lovely wife, she – she sort of knew her responsibilities, I knew my responsibilities and we each had our kingdoms and didn’t cross across the line, and let the other person get on with it and a very very stable and happy marriage. She loved children and brought up three lovely kids, and then … once the kids were off her hands, twenty, twenty-two years or something like that I suppose, then she could develop herself, as long as she kept the house and everything else going, so she said she never really had it so good as when she’d – the kids had gone because then – oh and she produced plays, amateur dramatics and that sort of thing, oh all sorts of things she did and very – very happily and did too. But what I did like is she never flogged anything too far, having … got through one technique then she’d move on. Where are we? Where has she gone, each end of these things was – should have had a
– has got a cover on it which I can’t find, which she knitted, anywhere. So there for instance, you see that – that’s something she knitted and devised and spun. So there we are, so you know, she was a lovely wife and I miss her greatly, there we are.

_Hmmmm._

Right.

When did you get married?

When? I honestly can’t remember the date. Married in – in – [laughs] surprise surprise, her father’s church in – in Eastbourne and the – his congregation were absolutely overwhelming in their generosity of presents to the – the rector’s daughter which was grand, so that was grand. Then we … had some digs – ah, that’s another point, because her father knew many people and of course knew vicars at other places, I think vicar’s the wrong word, what are they called, Methodist ministers.

_Ministers, yeah._

That this created a – a – an old boy network, so for instance when got married and wanted some digs, low and behold her father knew somebody who was the – what do you call it, man’s got – the name’s gone again, the vicar, the –

_Minister?_

Minister in the … area just north of Hyde Park, Maida Vale, that sort of area, who happened to know somebody else to ran a block of buildings, and so we got our first flat that way, and very sensible because the chap knew that we’d pay the rent and that we wouldn’t go and have drugs, well drugs weren’t a situation there, but certainly that we would be sensible and sane people to employ in his – have in his house. So yes, so we had a – first – first flat – or flat let, right up the top of a block of Maida Vale, Southerland Avenue, Victorian houses and then we got a bit more money and he found … Dora’s father came from an amazing family of four brothers who was – had been brought up in a village, of Blaydon near Woodstock and it – where Churchill
was buried, near Blenheim Park and these four brothers were brought up – their parents had died, brought up by an uncle who was a stonemason and yet they all did terrifically well, very well indeed. This chap – my father-in-law became as I say a Methodist minister, went through Cambridge, Ox – Oxford and then one of the other brothers became company secretary for Carrera Cigarettes. Another one became a – a deputy – an under minister in the government. So incredible, four boys of no education at all, from a little village in Oxfordshire, all had got something in them, some spark that they rose up through, I think quite extraordinary, anyway, so that was that. So one of these as I say was the secretary for Carrera’s Cigarettes and quite – a very rich man by that time and he had a farm somewhere down Guildford way and owned two blocks of flats in Finchley, and low and behold we got a block of flats there, so we moved from there into a flat which was gorgeous, that worked well and by that time I was working at GEC Research Laboratories Wembley and I could cycle between the two. Oh interesting, I had one of the very first … bicycle conversion kits, where you bought a little petrol engine about that big, which bolted on the back of the bike just behind the saddle and had a gear which under pressure pushed down onto the tyre, actually onto the tyre, so you started up this little engine and pulled a lever which pulled the engine at the back down – down onto the tyre and this metal gear, and it looked like a gear [makes engine noise] grabbed its way onto the tyre [coughing] and for some reason it didn’t destroy the tyre, and so you could pootle along on this thing at about twenty-five or thirty miles an hour, and I used to go down to Eastbourne with – propelled by this thing. Apart from the – the terrible business of – of grinding on the tyre it wasn’t a bad idea at all. Later they produced them in the hub and you didn’t have this business of pressing onto the tyre, so that was – that was that, yes.

_Hmmm. Did your wife carry on working when she got –_

Yes, she worked for a couple of years while I was still at university, working for my MSc, but when I … moved out of university to GEC Research Laboratories at Wembley, then we started to have a family and she produced our first child at – at this … flat in Derby Lodge, Finchley, Derby Lodge, Finchley yeah, so she did go on working and she used to go from the … flat let we had in Maida Vale to Hammersmith Hospital, where she’d – yeah, she’d – and she typed my thesis on a
very old typewriter, a very extraordinary old typewriter which she’d borrowed, which
you couldn’t see what you were typing, you had to lift the whole typewriter up like
that to see the bit of paper and the move the – swing the typewriter back over the top
of it, very ancient and antiquated thing it was. So anyway, but the thesis was all right
[both laugh].

[44:38]

What other sort of technologies were in your every day life by this point, you’ve talked
about motorbikes and – well –

Ah, later on, after this wheel business I got myself a proper motorbike and sidecar,
‘cause children were coming along and the sidecar was a great big sidecar where you
could – two people would sit in it, but in fact we could get somebody and three
children in it which – when they were small, so it was a great big long thing. BSA
M20 750c side valves engine, yeah, good old bike.

Hmmm.

[45:17]

Half past five.

Probably got another fifteen, twenty minutes I think.

Okay.

Why did you decide to go to Imperial in particular?

… I can’t think of any reason why I knocked on Imperial’s door other than anybody
else’s, there must have been a reason, somebody – I must have met somebody or
heard something but I don’t know. And I didn’t know anything about John Lamb or
ultrasonics of course because I had to do the first year’s refresher course again. No, I
can’t think why I went to Imperial. It may have been because I visited the university
– wrong again, the museums in South Kensington as a child many many times and I would have got – I would have regarded that as London University around there, that may have been the reason.

_Hmmm, yeah, I suppose Imperial’s campus is right next to the science museum isn’t it?_

That’s exactly, City and Guilds is, yes.

_Hmmm. Was it just you working at this laboratory or –?_

Most of the time, yes. Yes, I had it all to myself. No, the one other research student who came in there who had a bit of work – now what he was doing was he was trying to measure the ultimate breakdown strength of electrical impulses as electrical voltage of polythene, polythene was on the up and up in the – and polytechnic as you know is CH2-CH2 de-de-de chains and … the theory was that the actual molecules should be far higher strength against breaking down – than there was actually showing in practice, so was this contamination of the – the sample or what was it due to that you didn’t get this. So he was – his project was to force spheres, steel balls, into a sheet of polythene, so there was a very very thin neck of polythene underneath the sphere and then test the – the voltage strength of that little thin thing, that’s about all I can remember of that. But there were other people working on other projects, but there was practically no interaction between one and the other, not socially, there could have been socially I think but because I’d got a girlfriend and was – didn’t have much contact with their social life. Their social life, they got a – a strong student union, student union, but I was a research student which was a bit different I think so I think that put in a different class, and of course I was three, four, five years older than these horrible lads. I was more mature and been through it all before and actually having a glass of beer was not such a great experiment. Hmmm …

_Were there any sort of lab technicians there as well that would help out?_

Yes, that was one of the good things, they’d got a very good lab technicians workshop connected with the – the research, and in fact all these tanks and things and – were all
made beautifully out of brass by the chaps there and turn them up and … excellent. The tank that the handles the – the holders for the crystals, all that was built by the laboratory technicians, excellent.

_To your specifications then all this?

Specifications is a – mutually designed is a – would be a much better way of putting it, yes, no, I’d come to him and he’d say, ‘Oh well what about?’ and I’d say, ‘That sounds a good idea but it can’t do that,’ ‘Ah, but if I do that it can,’ so interplay between the – the – the customer and – and the supplier. Yeah, beautiful. Yeah, so some things you would produce a little drawing and give it to the chap but there was hands-on, he used to come and see you and look at it and I’d go down to the workshop and, ‘How is it doing?’ ‘Ooh, I’m having a bit of trouble with that,’ ‘Well I don’t mind about that, what about that,’ you know, so there was – yeah, interplay, yeah. Good chaps, lab technicians.

_Were they sort of long service people or –

Yes yes.

_Technically trained or –

Yes, oh I have no idea how they were trained, but they were part of the establishment and provided a service to all the people who – who were doing research there, yes.

_Hmmm. Could you tell me a bit more about the sorts of jobs they would do?

Anything that was dictated by the research underway, they didn’t initiate what they did, they were purely the recipient of requests from twelve, fifteen research groups that wanted things done. At engineering I – I couldn’t tell you what all the other groups were doing, but for sure bits of engines were being worked on in various ways, cylinders and – you can imagine can’t you?

_Hmmm.
So you finished off your MSc, did you have a viva or an interview or …? 

[Laughs] I was frightened you were going to ask me that, I can remember my PhD one intimately and we’ll come to that, but did I have a viva for my MSc? I don’t think I did. I don’t think I did. I – I – no comment is all I can honestly say, I should know I suppose, perhaps you could get MScs by just looking at the thesis, and who looked at thesis’ and signed it off I can’t remember.

Hmm. Do you mind if I just adjust your mike one second, I’m just a little bit worried it’s – [adjusts microphone].

Is that all right now?

Yeah, that’s fine. I was just – I couldn’t quite see if it was rubbing on your shirt or not so –

What time do you want to finish?

Shall we give it another ten minutes?

Yeah.

And that’ll give us no great rush to get to the station and –

Right, I say – if you allow a quarter of an hour from here we’ll be about right.

Okay, that’ll probably give us more like fifteen minutes, I’m – so you’d finished the MSc thesis with or without viva [laughs], how did you go to work for GEC then?

Good question … every year the … colleges and other suppliers of graduates get together with the customers which are things like GEC Research Laboratories and a
series of interviews are held, as are now I believe and so that’s how it happened, yes, so I went to a GEC interview, I went to a Metric interview and so forth. And signed up for the GEC, [adopts excited voice] for the huge sum of 400 pounds a year, cor, it just is unbelievable isn’t it, unbelievable.

*How did you fund your MSc?*

Grant, oh yes yes yes, I forgot to say that, the whole of the ex-service grant for people to study was paid by the government, yes, no trouble and enough – enough money just, people were – yeah.

*Hmmm.*

And my wife was earning a little, hmmm.

*And GEC paid you 400 pounds a year, was that – was that a decent salary or –*

… It seemed like heaven when I got it … though after two years there when I – I think I got up to 450 I said, you know, ‘What are you going to do about this, what’s my future prospects?’ and they thought, well – and they wrote me a bit of paper and said, ‘Well you’ll get 500 in another year and 550 after that,’ and I – I sort of said damn this for a lark, I’m going to try somewhere else, and I did and … well that’s another story.

*Hmmm. So what – what were your duties at GEC?*

Ah, that’s good. GEC Research Laboratories Wembley was … the support for GEC, which was everything electrical, that was their slogan and so each laboratory was responsible to one of the factories and in fact I think worked on the factory budget, so mine was, as I say, responsible to the Marconi valve company which was at Hammersmith and they paid and supported and put work at and stimulated the work that my laboratory did. It was an old established laboratory, probably going twenty years or something like that, and many of the queries that came in were to do with valve manufacture, all the time performance of valves was being pressed on hard and
they’d got to do better and do more and less something – a thing was called microstic – wrong again, microphony, valves acted as microphones, because if you can think of a valve it’s got lots of little wires held in an electron stream, and if you go [makes pinging noise] on the thing, these little wires go like that and modulate directly, physically, how the electrons go through because the – the electric field is altered, so you go like that and the valve goes [raises voice] ‘dong’ and you get a noise out of your – your thing, so if you try to use that valve in a car or anywhere where it’s moving, it is subject to this microscopy and it’s a very serious fault indeed. And [laughs] – and it’s – one of the cures for these is – in valves, these are thermonic valves I’m talking about now, long before transistors, they usually had two sheets of mica, a top one and a bottom one, between which the cathode, the grid and the anode in a simple valve were strung, they had little holes in these things so you can put these things in and push the two sheets of printed mica, whole mica together and that was the jig that held this thing. So if one of these grids, say, didn’t fit tightly in its mica thing and can move a little, that would be a source of microphony, so the simple solution to that was you – you took this pile of stamped sheets of mica which would go in and you would – they were all made on the same machine, you would take one and turn it over and so – and then put in two sheets of mica and any off centre, or play, or large hole in one sheet would not be directly duplicated on the other, but slightly off centre, if you can understand what I mean, so if the loop was like that [demonstrates] on one, the other one was like that, so between them.

*Could you describe that for the tape* [laughs] *it’s –*

Yes, you – the tape can’t see, I understand. If you – one of the problems was that on one sheet of – well all the sheets of mica, a hole was too big and to the left-hand side of where it should be, if you take one of those sheets and turn it over, that hole would be on the right instead of the left, so the overlap area between those two holes was the – smaller than each individual hole so therefore gripped the wire tighter.

*Hmmm.*

Yeah?
Got it.

Good. [Laughs] So that was a typical job. I got myself – and they – they gave you great freedom to do what you – you wanted in – into research labs, you discussed with your boss what – what – who – who was the sort of lab leader and a man of … forty-odd, long experience, what was a good idea to do and I did – making valves work at higher and higher and higher frequency, and this consisted of taking little tiny valves and putting delay lines, little bits of copper usually, as the oscillating circuit, right up against the valve, so you could squeeze a little valve up to 1,000 megacycles which is – it’s quite a high frequency, so that was one of the things I did do.

Was that sort of work then connected to any particular industrial outcome or was it –

Who knows, who knows. You would write a report and it would be GEC Report 17267 or something and away it’d go. There’d also be some patents, all those things were done, yes, quite a few patents with GEC doing things on – with valves.

Hmmm. So your work then was entirely research based, it was …

Make that research and development.

Right.

Develop – I regard that curing of microscopy as a development problem, not a research problem. So very high frequency oscillators using stripped down valves was one of the things I worked on. Microscopy, trying to think what else I did. I can’t think at the moment but –

Can we go back to microscopy for a moment?

Yeah.

I was just wondering was – was this a particular problem in a particular type of valve or was it more general?
Any valve can suffer from it, and – yes, yes. Some valves couldn’t care less about it, if you’ve got a – a rectifier that is rectifying the mains, it doesn’t matter a damn if it goes [makes pinging sound] [laughs].

_Hmmm._

Microscopy was quite a serious problem in radio sets, particularly portables and things like that. If you touched the set it went [pinging noise] be-be-boing, it wasn’t – you do get it on piece of electronic apparatus now, I can’t think why but for different reasons.

_Hmmm._ So you were just sort of handed this problem, go away and solve it then?

Sort of, yeah. And I would visit … Marconi valve company at Hammersmith and talk to the people there, rows of these girls all assembling these – these – these valves. Hmmm …

So you were rectifying a fault in something that’s already been produced?

Yes, in many cases. In many cases, yes. Any problem that the – the valve company had either with the existing product, or developing into a new product, if they thought it was sensible they’d ask the research laboratories to have a go at it, yeah.

_Right, right._

And they’d get on with their every day job of getting stuff out of the door. ‘Cause electronic valves were developing very fast then, they had been what were called octal valves which had a – a plastic base at the bottom and big thick wires, big bases, and then the war came along and this was reduced down to valves where the pins actually came out of the glass itself, and there was no base around it all and that stuck into a holder, and they got smaller and smaller. And then about that time … in the war this must have been, I think GEC Research Laboratories worked very hard on this, and that is glass to metal seals where they managed to fuse – join in an airtight and
temperature tolerant way, say a glass circle, glass annulus, like a wedding ring, annulus with copper, so you could have a – a piece of glass into which had been fused some heater, and a cathode which you get off electrons, you could take a sheet of copper with wires that had been placed across a hole in this and brazed across a hole in this – this thing, and brazed this – fuse this directly onto the base with a – a circular seal and then a similar one on top of this for the anode which would have a – say a plate connecting the electrons, and by very very careful control of the spacing of the cathode, the grid and the anode, so they were millimetres apart, you could get very high gains and very high frequencies, this enabled you to get high frequency oscillators. So that was the next stage after these sealed multi-pin valves was these copper electrodes that came directly out of the valve and would fit – oh that’s a thing I haven’t mentioned, fit directly into a delay line, do you know what a delay line is? Anyway, it is – consider – consider a pipe, copper pipe with a copper rod down the centre of it, and a copper wall at the end of this pipe, by stimulating voltages across this line, you can make this line resonate and typically if – for instance if it’s a – a metre – say two metres long at this – no, half a metre long this – half a wave length long which would be a metre wavelength overall, half a wave length, half a metre, so if you had this line which was half a metre long, that would oscillate at 300 megacycles, ‘cause 300 megacycles across [ph] one metre is the speed of transmission of light, wave length times frequency was velocity. So if you made such a line and took this special valve with the seals on them, you could put it straight on to the transmission line and there would be no leakage of discontinuity in there and that would make an oscillator and that was very – a delay line oscillator. These sort of things were used in radar quite a lot in the war, yes.

_Hmmm. What did you use them for afterwards?_

Radar. [laughs]

_I was thinking was this something you personally dealt with at GEC or –_

Oh me, what did I use them for after the war? Oh nothing, no no, but making such an oscillator was part of my job in GEC Research Laboratories and I think that you’ll find there’s perhaps on it all – patents on it and that sort of thing, yeah.
Hmmm.

[1:04:52]

*Patents, do you hold many patents?*

I should think about 30, have any ever been any use? No. When we got onto my time at Hollerith remind me of that, there’s a good story about making patents. GEC Research Laboratories patented a great deal and had a very powerful patent office, yes. Patents are a curious thing, sometimes they’re worth a hell of a lot, sometimes they’re – they’re just not worth the paper they’re written on. Not because the idea isn’t any good, it is getting some money for it obviously. What time do you want to leave?

_Probably_ –

Twelve minutes to.

*Can we have perhaps just a couple more follow-up questions about patents?*

No problem, I don’t want you to miss your train.

*Oh it’s not till about quarter past.*

Oh right, okay.

*I think we’re good for time for another five minutes. How – how did they decide whose name goes on a patent when you were working at GEC?*

[Laughs] I never had any trouble about that, some people do because everybody says, ‘Oh I invented that, oh a bit of that’s mine,’ I’ve never ever had any trouble about that at all. The only man that actually has ever been on a patent who’s not been in on it with me, if I might put it, is the actual patent manager himself, who’s come up and
said, ‘From my experience and seeing what that bloke patented and that bloke patented, what about …?’ and so the patent has been modified to meet what he can get cover on and what looks a useful thing to have and he’s made suggestions in what we’re patenting, so yes sometimes the patent manager as well as me went on the patent. You’re looking worried about that, seemed perfectly –

*I’m interested rather than worried, tell me more.*

Absolutely, ‘cause I mean the patent manager of course has seen it all many times before, I mean ideas are coming across his table all the time, so taking an unstructured idea from one person and making it into a patent which could be described and, what is the actual thing you’re patenting, are you patenting the shape or its volume or its frequency or what, or is there something in there like the colour something that is vital, so he does all that and during that process he may warrant being included in – as part of the patentee.

*Hmmm. Do you mind if I maybe move your tie with your mic?*

There we are.

*Sorry [laughs].*

Still going?

*Yes, still going [laughs]. What sort of things did you patent at GEC?*

I’ll have to go and look but … microscopy [interviewee meant to say microcrophy] was – was part of the ones, I can’t think what the other – I almost certainly some – some high frequency oscillator using a valve, hmmm.

*Hmmm. What was the advantage of increasing the high frequency?*

Oh, very great advantages … bandwidth, the lower frequencies get absolutely used up with too many people trying to seize a slice of the – of the spectrum, the higher you
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Did it have any particular applications within certain technologies?

Really not my field, no, not my field.

Hmmm. I think that probably just about –

Ah, ought to say there, the higher frequency you go the smaller the aerial gets and therefore if you want it to be mobile you don’t have to have a bloody great revolving frame on top of the car, you can use a little thing about five inches high.

Right.

Hmmm.

[1:08:39]

What were your relationships like with Marconi?

Excellent, no problem, no. No, we were the – the corduroy trousered boffins that came and helped them out of trouble, and it was rather like that, you know, they’d say, ‘Can you come down tomorrow, we’ve got a problem,’ you know, and then we’d talk it over and go maybe we need to be involved, maybe not, but at least they had somebody to talk to. And usually what the research bloke had to say, ‘Have you measured it, how much, how did you do the measurements, how did you control it?’ you know, ‘what was the temperature?’ you know, and so – so just defining the problem and asking him to take some measurements almost always solved most things out, in other words most people don’t necessarily – they’d just got a problem, you know, and, ‘Oh look it’s oscillating.’ ‘Why is it oscillating?’ ‘Oh well look, you know, when we tap it does it,’ ‘Well have you tried putting some rubber under the seats,’ or – and all that sort of question, so as a discussion and trying to get some measurements and, ‘How much this is oscillating?’ you know, ‘what frequency did it
oscillate and what might be oscillating?’ are all the sort of questions you’d ask, ‘Is it the grid, is it the cathode or is it the anode?’ you know, ‘Who made the valves, when, what process did they use?’ yeah, ‘Is the tool an old or a new tool, is it worn?’ you know, all sorts of honest straightforward queries that … dialogue sorts out, yeah.

*Hmmmm. I think that probably does us time wise –*

Jolly good.

*I want to pick this up next time but for today [laughs] –*

No problem, well you’ll probably think of a few things in the meantime. Can I take this off?

[End of Track 6]
I think that will probably just about do it.

Right, this is Raymond Bird on – what is it?

April fourteenth.

April the fourteenth, jolly good, 2010 god help us, never thought I’d get that far, I really didn’t, I really didn’t, I thought I was going to die young because my father had heart disease and I – that was the way I thought I’d go, not yet [laughs] anyway. Right, boy scouts.

Do you mind if I just … running again.

Right, boy scouts and cubs, I was brought up in a village called Chaldon in Surrey and there was a little local cub group which faded very soon and then I joined the boy scouts, but the nearest boy scout troop was in Coulsdon which was about four miles away, through the country, or on the roads, so I had to cycle there and cycle back. I greatly enjoyed the boy scouts with their patrol system where you split up and had a patrol leader and his deputy and you – you worked for badges and that sort of thing, you did good works now and again … and boy scout camp was the thing that I greatly enjoyed, where we used to go – used to go on the south coast somewhere, pitched bell tents, circular ex-military bell tents with all – you all sleeping in a circle with your … feet sticking towards the centre pole, but then you – we did get patrol tents after that where it – it slept six or eight. Again, the boy scouts encouraged you to use your initiative to do things, make your own decisions, very – very in – informative’s another word, formative is a better word and no doubt this came from Baden-Powell’s influence from – from the – the Boer War. We were sent out on what were called first class hikes, one of the badge levels in the boy scouts was first class badge and one of the things you had to do was go out on your own, or with another chap, two of you went with your backpacks and your tent and your food, and you – you plotted a route with an ordnance survey map, go somewhere, write the report and come back again and that was very good, you know, ‘cause you’re what sixteen – fourteen, fifteen,
sixteen I suppose at this time, and you also met other boy scouts and got a good cross section of people because you would go to boy scout Jamborees where there would be scout troops from the poor Welsh mining valleys, inner London, country lads like me and so forth, so you learnt to mix together and … excellent. What else to be said about the boy scouts? Can’t think of anything else in particular.

[Laughs]  Learned to mix together, I’m –

Right, okay, let’s think. A social group like mine which was middle class, London suburbs, country lads, had a set of values and not necessarily the values of – of the brickie boys from the east end of London or the blokes who were already cutting coal in – from Wales. Much harder tougher aggressive lads, all right but life was different, life was tough for them, you know, where it was I suppose easy for me. Right.

Hmm. How did you get on at Jamboree at first, was –

No problem at all, no, no problem at all … camp fires had a lot in – in the boy scout ethos … singing round camp fires, doing little acts, little mimes or plays or whatever it was. The whole of the thing, looking back, was trying to develop the individual as far as possible to stand on his own feet and do things, but nevertheless to be part of a team and obey orders, and I think that ethos carried over. Yeah, but they’ve stayed [ph]. In some ways I – I’ve often felt that I – I hadn’t been as adventurous as I might have been, I don’t mean about going on journeys and that sort of thing, I mean willing to throw up a – a particular job and try another job, I’m much more … been static and stayed in one firm and worked up that firm. Okay?

Hmm.

[04:51]

Could you talk a little more about music as a child as well with your –

[Sighs] Not much to say, it’s just I liked tunes. I – but as for any musical understanding like scales or – or half notes or keys, not a thing, I mean it was which
keys do I press on this thing to make this tune that I know that I used to sing at boy scouts, so no it was purely mathematical engineering background to music. But as for soul or feeling not a sign [both laugh]. No, so purely mechanistic attitude towards music.

_Hmmm._

But then of course you could understand what the singers were saying, that you could understand the words that came – if you listened to a tune like Gracie Fields or something like that, every word came over and you knew what it was, if you tried to link – hear … a pop song now, you won’t necessarily be able to understand all the words.

_Hmmm._

So there we are. And pop music has got far more complex of course than it was then.

_Hmmm._

[06:06]

Right. _The last time – on our last interview we had more or less reached the point of your career when you were working at GEC –_

Yes.

_Wembley. I was wondering if you could tell me a bit more about the atmosphere and company attitude of GEC?_

GEC was a – a conglomeration of firms all moulded together by Lord Weinstock into a – a company so they had different works doing different things. Mostly horny-handed sons of toil work, like glass blowing or whatever it happened to – happened to be, making wireless sets, what have you. Who decided that GEC should have a research laboratory centrally I have no idea, but it was set up at Wembley and it had a
series of laboratories, twelve, fifteen, twenty with two or three rooms for each laboratory, very well planned with centralised supplies all up in a gallery where the – the electricity came along, the water came along, compressed air came along, even gases were – were transferred along this to various labs that wanted – that wanted it. The particular labs were associated with particular companies in the GEC group, so mine was associated with Marconi-Osram Valve Company which had their works at Hammersmith, so the tasks we were given were associated with valve making or development, so the ‘research’ that I – research is a word that is very … abused, very very abused, people would say that we are doing research now, can you believe it. Anyway, so they would put tasks on us, we’re having to throw out all the – this percentage of valves from the production line because they’re microphonic which means that if you do that to them [demonstrates] they go [makes pinging noise] doyng, because the electrodes inside – inside move and modulate the electron flow stream between the cathode and the anode, so you do that and it – it acts like a microphone effect, micro – thing, so we had the task of developing cheaply a method of stopping that. And the – the method was dead simple actually, the – the valve consists of a number of elements, a cathode, a grid and an anode held – held in position accurately by two pieces of mica which had been stamped out with holes in so that that – you assembled the valve between these elements, between these. So somebody said, ‘Ah well it’s the tolerance on – on these things,’ so they first started off by trying to make the tolerances tighter, but then somebody says, ‘Well turn it over,’ so if you turn – they were – a mirror image thing so if you turned it over any play or disparity on one would be that and on – and if you turn it over be on that way and that worked a treat, so that reduces [both laugh] – very cheap, except you had to make twice – twice as many sheets. Be interesting to pull some valves apart and see whether they still do it, but the – they don’t make valves now anyway. So that was that, but also there was an effort to – oh you were given a lot of freedom incidentally which was great and one of the freedoms that I exploited was to try and make the valves work at higher and higher frequencies, and the trouble was not the valve so much as the length of the connections getting to the valve, so we – we stripped all the base off the thing and took the wires directly out of the – the glass seals and put them on little copper resonant lines and made an ordinary valve go up to 1,000 megacycles, which was quite good. So that was the sort of thing we did.
What were your colleagues like?

Excellent, some of them extremely clever … all – all graduates, what have you … I suppose you could say that the – the lab boss was usually a man of forty or fifty who’d been through it all before, who was part administrator, part … academic, the – and there was usually one or two elder men who that was their life, they’d settled in there, but the younger chaps like me, this – on – usually was – was a stepping stone to something else, two or three years doing this sort of thing. Every year we had an extremely good children’s party where the – the amount of money and effort spent on doing things – every lab had a – had something to demonstrate, so all these kids with their parents went through – could never do it now with them, bloody health and safety bastards, that … they had – for instance our lab, because we had valves we had a – a little aeroplane with a receiver in it which dropped a bomb sliding down a wire onto a – a – ‘cause of course just after the war, you mustn’t forget it’s just after the war, there was a target on a ship or something like that and the child was allowed to press the – the button to release the bomb and this – was – taught the child a lot because they started of course by releasing the bomb when it was immediately over the warship so the – the bomb went way off, so they – they learnt something about trajectory and – and some kids learnt it brilliantly, didn’t have to tell them, but others, you know, didn’t – didn’t focus, so interesting. Another [laughs] interesting thing was that the patent people were already around us, all the time, nicely, ‘What are you doing, how’s this?’ you see, looking for patents to patent and one of the labs developed a – a racetrack where the – the cars went whooshing round this and … now what was it … when you pressed the – the button normally to get – get to a corner, the car would slow down so it didn’t fall off, however some bloke messing around decided, no, we will make the bloody car go backwards, so you pressed the button and the car start [laughs] – started to go backwards, that was terrific, trying to drive these things round this track when you couldn’t make the car stop, you could make it go forward or backwards and as you can imagine it was hilariously funny and the patent people took that and – and patented it and it did appear in – in – you know, arcades, so it was a patent that got actually applied, [laughs] so anyway. But anyway, a good place, good food, good company, good social circle if you wanted that of course, yeah.
**Hmmm, good food?**

Yes, the … the canteen was of higher quality than normal, yes, yes.

**What was conversation like over lunch at the canteen?**

Well it would depend who you went with of course. You had your own circle of friends who met at lunchtime and you – you talked to them … one of the chaps at the lunch table with us was a German Jewish refugee and, yes, you would – one had heard about the Jewish problem and that how – a lot of them had got out and so forth, but actually meeting one was quite interesting, and we called him old dry rot because his job in Germany was developing and applying dry rot at – not antiseptic, anti-fungus, anti-fungus sprays and that sort of thing, and also woodworm and all those other things, so I remember old dry rot, yes. He was a terrific advocate of what now had become the European Union with all its stars and things, he wanted Europe to divide - to unite, which was interesting at that date ‘cause it was fairly early on, yes.

**What were the other opinions on that sort of thinking at the time?**

Can’t remember, I can’t remember, can’t remember … let’s think what else to be said about GEC Research Laboratories.

**Who else was in this circle of friends round at lunchtimes?**

Oh just chaps that were in the same lab as I was in … they were all ex university chaps … and of course it was a – at the time of life when you – you – we were having girlfriends or even early marriage, so there was that. I was married at the time so that meant that I didn’t join in with the single people in their evening activities, which were dances and things like that, and going to the theatre, no ‘cause I had a – had a home and a child. Right.

[15:52]

**How did your career progress at GEC?**
Ponderously. GEC had a very set scale for paying laboratory researchers, as I was, and ... I think – it was something like this, you were paid 400 pounds a year for your first year, 425 on the next year, 450 on the next year, so it wasn’t exactly a scintillating career prospect, which is why most people got out at a certain time. The other thing is of course that the attitude to GEC Research Laboratories, by the companies that were funding these various laboratories, parts of GEC, wasn’t necessarily entirely enthusiastic, in other words they’d been forced or told that you will spend five percent of your – whatever it is, your budget on – on supporting GEC Research Labs, so some felt they got their moneys worth and some didn’t, which I think is in fact very true. Out of – out of the time I was there, because the – the magnetron, which was a very high frequency valve developed partly at GEC, which was used in air borne radar and very very precious secret while it was being developed, the boys at GEC were experimenting in a sort of humorous way with using it for cooking and that’s what the microwave is so – but whether this was at GEC only I don’t know what else was happening, but it’s just interesting. It sort of shows how narrow-minded I was, I thought it was absolutely disgusting using this precious valve to – to cook things with, but there we were.

[Laughs] Sounds like there’s a lot of different activities going on around you, it’s –

It was a very stimulating area, yes, and if you could – if you could ... focus on that yes, it was a good place to be. I ... except for the pay, it was a – a very very good place indeed, good – an excellent library, yeah.

What sort of other facilities did you have then?

Oh anything you wanted, anything you wanted, the facilities, oh yes yes, a huge workshop where you could put your, ‘I want this,’ ‘Oh yeah, when do you want it?’ ‘Tomorrow morning,’ ‘No problem,’ and you know you’d get it. And also the workshop people weren’t just horny-handed sons of toil they were – they were creative, they would say, ‘Well what about, could we?’ so it was – there was quite a lot of feedback on that front. Glass blowing as you can imagine all over the place, making fluorescent tubes, valves, what have you. What – what else ... coil winding
which you need obviously for relays and all sorts of other – motors, that – that could all be done for you, so there was very good support services.

*How much benefit is this support service in – in your daily job?*

Oh extremely valuable. Because if you take – take a bloke who’s a brainy chap and he then has to spend three weeks winding a magnet, it’s much better to – to say to a – a skilled magnet … winding service, ‘Wind that magnet for me,’ and get on with something else, no, excellent support service, yeah. I think that’s possibly one of the differences between the university and GEC Research Laboratories, yes, there are support services at – at the universities, but I think the GEC Research Laboratories, because of more money, was better, yeah.

[19:44]

*You said you had a lot of freedom in your work as well, what sort of structure was on you to get your job done?*

Structure on you to get your job done, that phrase doesn’t – no no, I’m just saying that’s – I’m – for good reason, that is not how it was. You had a meeting once a month with your supervisor or the boss, how you’re doing, what about, shall we, and you told him what you were doing, had a lot of freedom, extreme amount of freedom, and I – I think I produced ten or twelve or fifteen patents at the time, if you’d like to switch off I’ll go and find them. [Break in recording]. Patents, GEC Research Laboratories Wembley had a large patent department because this was one of the main reasons for the laboratory was to get new ideas, patent them and protect them and – and develop them and when you think of all the sort of development phases at – particularly for instance microwave ovens, now if you took … magnetron and developed it for a microwave oven and made – for cooking, that would be a phase of patents that would be interesting, but fluorescent lamps were being developed, there’d be a patent on those, patents – patents, all sorts of patents, yes, and skilled patent engineer – engineers, scientists, technicians, I don’t know what you call them.

*Patent agents?*
Yeah, patent agent is – yeah, patent agent in a way would come and quiz you and they were good, just the same way as you are bringing out of me various thoughts, they would, ‘What about this, could we?’ ‘Oh yeah, you could do that,’ ‘And what about so and so?’ so they would stimulate you into – and that’s why sometimes these patents have got two people’s names on, one is mine and the other is the patent engineer or manager or patent agent or whoever you’d like to call him who had quizzed me about it and between we had – we had found something new and we’d then patented it.

*Could you – could you talk me –*

Cartwright is one of them, yeah, on you go.

*I was just wondering how you go from having an idea to having a patent, what’s – what’s the process that –?*

Well the patent that – when you have an idea … you either contact the patent manager … for instance there’s – [shows photo] that’s the chap and – and say, ‘I’ve got an idea,’ and he’ll say, ‘Oh I’ll come around and see you,’ and then you – you would then talk it through and by cross fertilisation, this is I think the phrase, you would evolve something that is not only new but patentable, ‘cause it – the – what is patentable and what is not patentable is a sort of an art unto itself because it mustn’t infringe other patents. It must be new, you must be able to describe it, it mustn’t be airy-fairy and up in the air, so yes, so fairly long sessions would take place. And then the chap would come back from the patentayers and say, ‘What about this?’ and that would be the draft and you would then go through with him. And then wouldn’t necessarily hear anything more … patents aren’t necessarily for actually being used, they’re – they’re a weapon of war between you and other manufacturers … yeah, as I say, for instance our war was with – with IBM, when we were in the computer field, and on the whole the companies didn’t want to fight other companies over patents because it was very time consuming and that sort of thing. Only in extremist would they do this, and as I expect you’ve seen in America now, certain huge, very valuable patent wars do go on, particularly in the software field, yeah.
Hmm.

But the other thing is, that it’s not necessarily a good thing to publish a patent, because of course it tells other people what you’re doing and they may say, ‘Oh I can just get round that, I’ll make it triangular instead of round,’ or whatever the – the way round it is [laughs] and I – this is probably hyper – what’s the word, hypothetical no, apocryphal, but it is rumoured that if something is published, then nobody can take a patent out on it because it’s in the public domain, but you don’t want people to read something that you’ve just put in the public domain necessarily ‘cause it will only stimulate them, so it is rumoured that some companies wrote articles which were published say in the Serbo-Croat Zagreb Times [laughs] or something like that, so that they were in a foreign language and weren’t necessarily scanned or picked up by people that troll publications all the time, there we are.

Hmm. Was … where did GEC actually come into this patent thing, did they get any say over what’s being patented or is that –

These were, that’s what I’m talking about, yes, oh yes. The research laboratories had its patents department and what got patented is what they wanted to patent, not what I wanted to patent, I was just a mere – a mere tool, I was the sort of – what’s the word I want, the seed corn that produced the – the shoots which they would then harvest and make into a patent and patent, yeah.

Right. How did you get on with GEC management then?

What management, you know, we were just – I was just down there, who knows? In the research laboratory we were left pretty well on our own, very sensible, no GEC management was all – was, yeah, no grumbles about them at all, no.

Right.

[26:17]
“So you worked at GEC from when to when again sorry?”

Good question, I — I think we’d got — we’d — hadn’t we — didn’t I give you a sheet?

*You did actually, I’ve got your CV in my bag [laughs].*

Oh right, oh right. You can put the dates in later [both laugh], ‘cause I can’t remember accurately when the dates were now. So I was working at GEC and I think I worked there for two or three years … and then to my surprise I had a phone call from the professor at Imperial, City and Guilds who was Willis Jackson, Professor Willis Jackson, who I think I mentioned was both a good and a bad thing, because he put on two extra years on — on me having come out of the forces quite unnecessarily, but there you are, but he was an academic. So he rang up and said — in effect he said, ‘I shouldn’t really be making this — this call because I’m not supposed to help somebody else poach somebody else but,’ I’m paraphrasing now ‘cause he didn’t actually use these words, but this is what it came down to, he said, ‘I’ve got a pal called Womersley who’s looking for a chap with an inventive streak to work — work on counting with valves,’ and he said, ‘I know you — you were messing about with signals and radar and things ‘cause you did the MSc with us and you were good at taking bits of apparatus and making them work for whatever you want to — make a pulse — in this case a pulse application,’ so he said, ‘this chap'll be contacting you, do you mind?’ ‘Not at all,’ so that was that. So then a chap called Womersley rang me up and he … had been — might still have been, I think he had been boss of the mathematical laboratory at the National Physical Laboratory, labs, which were early off the mark in developing computers for academic purposes, scientific purposes, and they had — or were developing a machine called ACE Pilot Model at Teddington where the NPL was. So anyway I was invited to meet Womersley who was a big robust sort of somewhat florid chap of approximately forty, forty-five, a great gift of the gab, lot of personality, and he said that he had been retained to set up a computer design facility for British Tabulating Machine Company, I’m trying to think whether the word computer was used, I — yes, I think it probably was. Anyway, so I went to see him, and taken to Letchworth where the British Tabulating Machine Company had their factories and their development laboratories, and of course they were entirely electromechanical except for one exception which I’ll come to in a minute.
And I was offered a fantastic increase in – in pay if I went there to 900 pounds a year, so nearly doubling my salary, so I took on this job and already working at Hollerith in Letchworth were a team of electronic engineers under a chap called Billy Woodshill who was developing calculators and had developed, not was developing, had developed them, a calculator was a punch card machine ancillary which worked in Stirling, which was vital, and it would take two figures on a punch card, multiplying them together and punch into the punch card whatever it was. So if a man had worked thirty-seven hours at seven and sixth pence a week – an hour, then this would then go towards his payroll or whatever it was, or thirty-seven shirts at four pence halfpenny, you know, whatever it happened – multiplication was very much a need in the punch card world. Mechanical multipliers were big and unreliable and relay flapping away, so electronic multipliers were great, so they had printed circuit boards with valves on that – no, they hadn’t got printed circuit boards, printed circuit boards weren’t with us then, everything had to be wired component by component, and they were part of the punch card range. Then Billy Woodshill developed a calculator which was like a multiplier but it had a whole series of steps that you would plug up on a plug board, take this – this number, add it to that number, subtract that number, test to see if it’s positive or negative, if so put it in that, so it had calculator – yes, calculator – counters inside that would do all these things. And very sophisticated machines, and jolly nearly a computer, in fact many body could argue that since it had a test facility it in it really was a computer, which you could use as many times as you liked. Anyway, so he was an ex-RAF officer and an ex-Ham and a man of great inventive ability, yeah, he was an inventor and was doing pretty well, so when I came along I was a threat and actually – but to give him his due he was extremely accommodating and I got on well with him and his lads, and I was taken by Womersley to this room, about half the size of the room we’re in now, say fifteen foot square, down which there’d been a bench, or two benches, one each side and Billy Woodshill got a bit of chalk and did a line across the bench three feet from the wall and that was mine, now it sounds bloody mean but it wasn’t considering the amount of area he had to work on himself, so we got on very well with him and then I moved to another lab and we got on excellently with each other. He – he was a one for the women, he was a drunk and eventually died as an alcoholic, a great shame but he was an excellent man. And interesting to remember, thinking back, quite a number of people in the early computer world turned out to be alcoholics in the end. I wonder
why this was, in some ways I think it is because the computer developers got
sidetracked by the managerial men, who came in later, who were – who were good
managers of men but necessarily hadn’t got any inventive or – or entrepreneurial
experience, and I think this possibly pushed the blokes who had had the – the
inventive ability and the power that went with it into a corner and that may have made
them drunks, but I can think of quite a few that went that way.  I drunk a lot, but not
excessively, but I did drink a lot and it was – it was part of the – the culture.  What
else to be said?  Anyway, so there I am at – at GEC, sorry at … British Tabulating
Machine Companies research laboratories in Letchworth, I move my house to there
with my wife and kids, which was grand, just on the edge of the town, Letchworth is a
very pleasant garden city to work in, nice streets, all with trees down them, parks,
good pub, but it was dry, was dry ‘cause it was I think … Quaker stimulated, so it was
surrounding by a ring of pubs, that’s putting it a bit thing, but you can imagine that –
so the local villagers developed pubs and some of them were actually built on the
edge to supply the – the drinking needs of the boys inside.  Letchworth itself was an
interesting town because it had encouraged a whole lot of forward looking companies,
like British Tabulating Machine Company.  Spirella was very strong there, that made
women’s corsets, a vast number of women were employed doing that, lots of
engineering companies had their developments activities there, or manufacturing area,
it was on the edge of a town called Baldock which had a lovely lot of pubs in it, so
good – good place.  So going back to what I was – I was doing … Womersley was a
stimulator and an encourager, he had no real inventive ability himself or design ability
himself, he just provided the tools and the stimulation for blokes like me who had
these abilities, but needed encouragement and everything that went with it to do it, so
he was the right man for the job at the time.  He had been, as I say, boss at
Mathematical Laboratory at … NPL and the joke was that Turing – you’ve heard of
Turing, and another chap Davis, had a bet with each other of so much, the first time
Womersley actually wrote down an equation, he never did [laughs] so that was that.
But I mean fancy, I mean trying to combat Turing, I mean wouldn’t even start, you
know, [laughs].  So there we were.  So coming back to GEC Research Laboratories,
so to BTM … it was a – like GEC Research Laboratories Wembley, a commercial
operation with a – in this case a defined target, which was to develop a commercial
computer.  First – I had a – Womersley couldn’t drive a car for some reason and I had
a motorcar and sidecar and I used to take him all around in this motorcar and sidecar,
and because he knew everybody, ‘cause he had been boss of the mathematical laboratory at NPL, we went to the – the – the government radar development and – establishments that were dotted around the country, there was a place at Malvern, TRE, there was SERL. I think it was called somewhere else and so he introduced me – oh took me to Cambridge to see – to see Wilkes, which didn’t go down too well, and what else did we – sort of anyway so he – he again provided me with background and environment. He was very good at this, and he was a man that was mocked which I don’t think is fair, he did his job such as it was. Yeah, he was a boastful – what’s the word I want, conversation … what’s the word I want, he cornered the conversation, very fond of his own voice, and … sad because he was a good – great chap. What else to be said? Right, so there I was, what happened next was that a bloke called Dr Booth who was professor or head of – I don’t think he was a professor by then, no he wasn’t, he was just a – a lecturer at Birkbeck College, had been developing computers for possibly four or five years, small … highly ingenious, he’d got a wife called Britain who he’d married who [laughs] – who was also a mathematician and he’d come to British Tab because he said, ‘Look, I’ve got this computer,’ and it was – it was very small, incredibly ingeniously small … ‘cause it – he liked being economical in his designs, he was as near a genius as I’ve met. He … wanted some input output for his computer … he had been messing around with tele-printers and those sort of things, but he wanted punch cards, because they struck him, that that would be the way to get in and out. So in return for punch card apparatus free, tabulators and that sort of thing, he would give us – Hollerith, the design of his machine that he was developing. So I and two other chaps … Bill Davis and … Dickie Cox were sent in a very cold winter indeed, rather like the one we’ve just had, only worse, where the roads were genuinely blocked for a long time and so forth, me on my motorbike and sidecar and him on his – ever heard of a Vincent HRG – HRD, it’s a huge four cylinder beautiful purring motorbike, to die for, you know what these things in America are that everybody – Harley Davidson’s, well HRD was Harley Raoul Davidson, so these were built at – now I haven’t heard of this connection being developed, perhaps the Americans don’t like it, but anyway it was – they were – these machines were being developed and made in Stevenage, lovely machines they were, black – black shadows and that they were called. Anyway, he loved his machine, so we were stationed in Banbury in a hotel, a very nice hotel, and we would go out to Doc Booth’s so called laboratory, he – he lived at The Wharf, Fenny Compton which
is a little village just north of Banbury, ten miles north of Banbury, and The Wharf naturally was on the edge of the canal, which went by. His – his father was there who was also an engineer and he was developing this machine in a barn which was falling to bits, in fact the floor which was about – boards possibly – planks probably four inch thick had been so eaten into by woodworm that the – that the legs of the chairs went into the floor and you didn’t get – fall through, but you certainly got tipped off your chair if you weren’t careful. So anyway, there he was, developing this machine in this barn, and we got down to work of copying all this … it – what else to be said there? Other interesting, his father who was extremely mean about spending money, and it was as cold as hell, we had this electric fire to keep us warm while we were doing this, in the night he’d come and clip one of the bars to save money [laughs], but of course being electronic engineers we’d – we’d, you know, didn’t get – take long to – to – to suss out what was going on, but anyway, that wasn’t Booth, that was his father to be fair. So we – we took these plans back to Letchworth and built a model of it, recreated it, which was called HEC1 and that machine was an almost exact copy of a Booth machine, nothing – he didn’t like plugs and sockets and how wise he was because they were – of all the things that caused problems in – in electronic machines in those days, the plugs and sockets were it, the connections. So they consisted of … post office racks which are – ever heard of a post office rack? Right, so with standard post office racks which are about twenty, twenty-two inches wide, already drilled so you – you built a chassis, bolted it onto that, the … valve bases were put on – on these big chassis and the components just wired in all the way around like this, like they were – no plug boards, no anything, so they were – the – the most basic way of doing it you can think of, nothing wrong with that at all unless you wanted to maintain it [laughs] if you can understand what I mean, so you couldn’t say, ‘Take that thing out and replace by substitution.’ So he took it back and then my job was to make that thing … fit for working with punch cards, so I then designed a tabulator, which was easy because they were making tabulators all over the place and – which was interfaced with this Booth machine, so that you could feed information in from the cards and print the information out onto the printer on the – on the tabulator. So that was HEC1. It still exists in a museum in Birmingham, and I’ve been to see it, and … if sense prevails it will be taken from its Birmingham store which is … warm and dry it must be said, but it’s – it’s a – this Birmingham museum is an amazing place, Birmingham’s has decided we’ll have something of everything that was developed in
this place, in Birmingham as – as a town, so it’s got everything you think – you can
imagine, like cookery things, motor vehicles, motorbikes, cars and lorries, huge great
gears for – for gun turrets, various old computers like mine, stuffed antelope, don’t
ask me why they’re there, and so on, it’s full – domestic stuff, rack upon rack upon
rack, twenty feet high of all these artefacts that were made there, and my computer is
one of the things that’s there. And I went to see it and I’ve got pictures of it, be lovely
to see that go to Bletchley Park which Roger Johnson and his – his friend and
colleague who – Kevin – Kevin, I’m so sorry, I’ve forgotten his name, excellent chap,
are hoping to be able to do. So back to – to HEC1. So the other two chaps fade out of
the picture then, one of them works for me, the other bloke goes to do something else,
so there’s me and this one chap, Dickie Cox, very good chap indeed, ex-Ham, ex-
RAF. Those two things had quite an impact on this early development because the
RAF used to take – train electrical engineers called WOMs and WEMs at – at
Harwell, very good indeed, good training and discipline of course and then they
served in the war and at the end of the war many of them became Hams, do you know
what a Ham is, a Ham is a – a man that has a – a receiver and works on particular
wavebands and a transmitter and communicates all over the world with his pals and
they send messages backwards and forwards in a – in a set format, and they were
allowed to do this because the people that controlled the frequencies allocated them a
Ham band which they did this on, or several Ham bands, so very practical chaps, most
of them. At that time they were, later on they weren’t because you could buy all the
apparatus and just plug it in and go. But most of these chaps built their own rigs at
that time and they did mobiles and they’d all go and have a little visit on the Downs
and bring all their sets and communicants. So anyway … Dickie Cox and I and then I
– they had some apprentices and I acquired two of these ex-apprentices, they were
good chaps, and then I persuaded Hollerith that they ought to have some electronic
apprentices, ‘cause these other apprentices were electromechanical apprentices, so yes
they – they agreed to that, so they created two electronic apprentices that I – I had and
they were good chaps. So this little workshop which was probably about as big as
these two rooms by now, and we’d got quite a lot of room by this time [laughs] and –

How big?
Fifteen by forty … and of course we were supported by the workshops that were
developing new electromechanical tabulators and what have you, ‘cause tabulators
were still being developed and sold in huge numbers and there were vast factories
building electromechanical machines, relay manufacturing; Northern Ireland, a vast
factory over there doing it, so electronics was just a tiny little – it was both a joke and
a threat if you understand me, the … developers that I was with, though I didn’t
realise it at the time because it wasn’t talked about, had done a terrific job in the war,
the – the electromechanical development people under a chap called Doc Keene, K-e-
e-n-e, in developing the Bombe machine for Bletchley Park which was absolutely
vital as I’m sure you remember. And they – I think 120 of these were built, it – it –
all over and so they were – though they weren’t Hollerith machines in that they used
Hollerith parts, only slightly Hollerith parts, the mechanisms were new, rotating
drums and things, so all those were – were developed and built by Hollerith at
Letchworth under great great secrecy, and so much secrecy that when I joined them,
when I – I said, ‘What did you do in the war?’ it was a frosty reply, ‘Can’t tell you,’
you know, and very very – and it lasted for many years this secrecy. Responsible but
sad, because these people had done a hell of a – a job in – in the war doing these
things. Anyway, so this – these chaps like me who came in with the university
education officer type … corduroy trousers, what do you call it, sandals, brown roll
top pullovers, quite a different type for – from the chaps that were there, on the whole
we got on well with them, but – well because we – we’d been ex service chaps and
were used to mixing with people, so the – the we and they was not serious, not too
bad at all, no, and I think many of them realised that this was the future and they –
they bloody well better – some of them they used to come sort of putting their heads
round the door, ‘Can we come and see?’ ‘Yes you can,’ so we told them this so, but
their boss didn’t like it ‘cause he was a – a bloke called Doc Keene, he – he saw his
empire being challenged by these young lads who came in so he … wasn’t
cooperative, let’s put it that way. He said, ‘Never work, no no, some – every time a
lorry goes by all the valves will fall out,’ you know, that sort of snide remark, so we
had our own snide remarks back in the way, I’m trying – dirty handed sons of toil.
Anyway, so there we are. Development went very well at Letchworth … we took the
first machine … trying to get – this is where I may – got to be careful, the first
machine was taken up to London and demonstrated to the business efficiency
Exhibition; the Business Efficiency Exhibition was a – an annual show where all sorts
of machines were developed, a show like typewriters, filing systems and so forth, filing cabinets, all this sort of thing, and the top of the pile were British Tabulating Machine Company and Power Samas which also did punch cards, they had round holes, we had rectangular holes, they were entirely mechanical, we were electromechanical that we sensed the holes in the card by brushes falling through the little holes, making contact with a roller behind, and of course much more flexible because once you’d got into electronic form then you could take it away through wires to anywhere, but mechanics means shafts and gears and, ooh, anyway … so the first HEC machine, HEC1, was covered – oh covered yes, we had a very excellent panel basher, machine cover basher – maker, the sort of man that in his day had covered motorcars, made the wings, made the door panels, all this sort of thing, working with a hammer and sheets of – of metal cutting and grinding and banging and so forth. And he would literally come up to this machine that I had built with a – a tape measure and a – and a piece of – piece of paper which was a punch card ‘cause you use those all the time, and he would measure it up as though it was a suit of clothes, ‘Oh yeah yeah and what about?’ ‘Yeah, well I’d like a bump on,’ ‘No problem at all,’ ‘What about a little door there?’ ‘Yes,’ and so that was how it was, beautiful. As it should be that the bloke doing the job and – and – and the customer working very closely together. So the covers came along and were – were put round the machine, it went up to London to the Business Efficiency Exhibition. Now the Business Efficiency Exhibition was dominated by the electricians that provided the power to everything and they were terrifically unionised, you weren’t allowed to connect anything to the electric supply unless they did it. Believe me, the – they were a stranglehold on the whole business and it meant that lots of money changed hands behind the scenes to get the supplies that we needed. We shipped the machines up to London and of course unlike something else like a typewriter that you just put on the thing, we had to get the damn thing going again. So we had to work like fury into the late hours of the night in this huge Olympia Hall with its great domed roof and – and the lights shining down, but then come six o’clock or something [makes off sound], choink, the lights all went out because the electrician, that was his job, so then you had to bribe them to get the electricity back on again to run your machine. And so there we would be sweating away trying to get our machine working and there was another little pool of light about 100 yards away down there, so we went saying, ‘What the hell is this?’ so we went down there and it was Power Samas doing exactly
the same thing for their machines, so [laughs] anyway. So anyway, got the machines
going – because the … programming had hardly started … I – I built this thing and I
programmed it but it was so basic and small with a very small drum, of 512 words
only, that programming really didn’t … raise its head, but it was starting to – the two
… vac-sudents which I haven’t mentioned that came from the university and worked
with us, started to actually write the programmes. So one of the blokes called Harold
Ashforth was – wrote the first commercial programmes in the UK, and one of the
things we wanted to demonstrate was what computers could do and there were – the –
the Coal Board gang payroll was the thing that was interesting to develop. In the coal
mines a gang would have all their wages collected together in a pool and distributed to
the members of the gang under a – a negotiated scale, so in order to calculate the gang
payroll you had to do lots of little multiplications, I dug for so long doing that at so
much, and lots and lots and lots of little jobs, I pushed this card, I loaded the thing to
go up to the roof, whatever it happened to be and so all these had to be summed
together into a big chunk and then divided up, thirty percent for you, ten percent for
him, ten percent for him, five percent for him and so forth, to divide this out. So quite
a long calculating problem and that was the first programme that this chap called
Harold Ashforth wrote to demonstrate what computers could do, and that did open
people’s eyes to how – you can imagine doing that thing with just calculators or
multipliers, you’d have a room full of these punch card machines, doing all these little
subtotals and adding them together, and then eventually printing them out and
punching them, whereas it could be done all on one machine, properly handled with
the computer. So that was demonstrated. I programmed the machine to do noughts
and crosses, very simple thing – well it wasn’t that simple actually, so – and I had a
very good punch card engineer and I said, you know, ‘I want a display for this,’ and
that’s all I had to do, he said, ‘Well what do you want to do?’ and I said, Well this this
this,’ and he would go and do all the – the relays and the – the mechanical work and
we had a – I’ll show you pictures of these in a minute of the – the punch card
machine, with the lights coming up on the display, so when you pressed a nought –
you had it on the – obviously a board, pressed a nought, it would come up at the right
place, or a cross so forth. And so as you know, I think you know that punch cards –
noughts and crosses is what they – I’ve forgotten the phrase for it, but either side – if
it’s well played it’s a draw always, zero something, but you had to talk to people
about this, there’s a terminology for it. Some – some games, the person that plays
first has got the advantage, some things the person that plays second has got the advantage.

\textit{Sum zero game.}

That’s right. So this was programmed and put on this machine. What else was there that was done? Oh yes, the chap from the … marketing side, who was my oppo in British Tabulating Machine time, was called Ronnie Michelson, a Jew, an extremely clever Jew, an extremely nice Jew, I remember he was a Jew because when we had to deal with people in America and that sort of thing, the fact that he was a Jew and – and pork got served and created problems, but anyway, that – just beside what I’m talking about. Excellent, nice chap, very very clever, actuary, that’s the point, he was an actuary, so his brain was – was sharp. And he helped me very much by interpreting what he thought the punch card world wanted out in the field for my machine to do. It – thank god it was not at the stage where you would get a specification and argue about it for a – for a year as to what the hell it is you’re going to develop. The pressure to do it fast was great and since nobody else knew about computers, except myself and Ronnie Michelson, we were given carte blanche well [adopts requesting voice] ‘I want …’ ‘Anything you need,’ ‘Well yes we’d like …’ ‘No problem,’ so at that time the – the terrific stimulus, terrific energy put into it and what’s – blind faith on the side of the management to – given this horny-handed – sorry, this corduroy trousered chap from – from the university this money. But it – thinking back it wasn’t a big gamble because it had got to work, but also the amount of money looked at in a global scale wasn’t huge, but nevertheless it was quite a lot of – what’s the word I want, not forethought –

\textit{What sort of sum are we talking about here?}

Sum, who knows? Five chaps, a 1,000 pounds each a year, 5,000 pounds, a lab, all the stuff, double it, 10,000 pounds a year, so that’s – that’s their – money in those days, not present money. So it wasn’t out of this world when we were surrounded by large labs building electromechanical stuff, workshops and – anyway. Right, so anyway this machine was built, Ronnie Michelson programmed it to bid a hand of acol bridge, so we had punch cards, each punched up with what the card was, so if it
was a two of spades there’d be some holes in it which – which represented two of spades, so you’d say to a bridge player, ‘Here’s a hand, now – now what would you bid on this hand?’ and acol has strict rules as to how to bid, so the machine calculated what the bid would be, so it would be two clubs or five spades or whatever it happens to be. That went down very well indeed, but again it’s purely mechanistic, the bridge … what those holes are determine what the acol bidding system says you must bid. So it was not like playing chess, if you understand what I mean, no. But nevertheless it was a very dramatic – so that’s what we did, punch cards showing them acol bridge and also the machine would do nought and crosses, so it all went down very well and we had a good time.

What were people’s reactions to it when it was doing these things?

Depended, depended. The newspapers, just typical of newspapers, would get hold of this and get hold of the wrong end of the stick and produce all sorts of sort of rubbish in the newspapers, you know, ‘geniuses overthrow’, ‘total computing ability for business’, I’m inventing that but right over the top. The forward looking companies knew that computers were coming along, they didn’t know what they were, but they were determined to find out and one of the companies that was strongly knocking on our door was the bookmaker, Hill – somebody Hill, he’s still going I think.

William Hill?

Willie Hill, William Hill, and two Rolls Royce’s with our salesman in tow came to see us and drew up in front of our things you see and these guys were there, sort of black coats and hats, looked like something out of the mafia, you can imagine, came and looked at this and we said, ‘Well why do you want this, what’s it for?’ he said [adopts cockney accent], ‘Well you see, it’s like this mate,’ I’m being a bit rude there, he said – but they had a – a – what I might call a betting edge on his – on their voice, ‘Well what we have to – we have to do is, normal bets no trouble, but there’s things called accumulators which means that if you say I win that, all my winnings put on this next one, and if I win that all my winnings on that one and then if I win that, all, [mumbles for effect]. So accumulators almost always fail because the odds on getting these right are very low, but if they win we’re in dead trouble, and we have skilled
men whose brains work out odds because they live with it all the time, they know the odds on anything, but accumulators are just a bit too much for them,’ ‘cause as you can imagine there are permutations on the accumulation process as well, such as if I miss that one then I’ll go over and try that one and so forth. ‘So we’re looking at it as a possibility of quickly calculating the odds on accumulators, could you do this?’ ‘Well I can’t see any trouble at all if they’re definable,’ and so we – we talked about this and as we – and we had a good lunch of course and as we were saying goodbye to them, I said, ‘Well it’s lovely to see our machines possibly being used for sporting purposes,’ and a hard grim look came over the chaps, ‘Brother, this is strictly business,’ [laughs] and off they drove. Let’s go and have some food shall we?

[End of Track 7]
Track 8

Was about HEC1.

Yeah, I had a few questions about HEC1 actually … shall we take them through sort of in chronological order might be the easiest way to deal with it. When you first started working at BTM, what was the sort of company’s attitude towards computer …

I thought I – I said something about that earlier … they all knew it’s got to happen, but they – the computers in existence at that time were mostly very large, very expensive, scientifically used machines. So whether it would be possible to make a – a smaller, mass producible, reliable, cheap enough machine that could have a wide application in normal commercial applications, scientific applications, government applications, was far from certain, well there weren’t any machines doing it of course. So the choice of the Booth machine as a starting point was absolutely excellent because his design was so economic that it enabled me to design a machine which could sell for 40,000 pounds which the other things on the market would at least by 100,000 pounds and – and considerably more. So we – not only did Hollerith have a suitable machine to market to the commercial world, it also had a large semi-captive clientèle with all the huge punch card machines installations, which of course is the – the customer base it was trying to defend, which was vast, not only in this country but all over the world ‘cause it had a lot of overseas business.

Hmmm. Was there any resistance within the company towards moving towards computing?

Yes, of course there were the sort of die hards that said, ‘Oh you know people – it’s much too complicated, people – can’t have a programme – people programming things, you know, no no no no no,’ but it – you know, they gradually faded away, or suddenly discovered they – they were keen on it all the time, you know. [both laugh]

You mentioned that you went on visits –
Going back to the other point, the interesting thing was the attitude of the British Tabulating Machine Company salesmen, the key salesmen out there in – in the various regions and – and what – what they thought. Many of them were encouraged by their – their customers to do it because they’d heard about these machines in America, they saw them being used for scientific purposes and, not being done, they said, ‘Yeah, go and do it.’ Also some of the brighter salesmen were knocking on my door which they weren’t supposed to do, ‘cause you always keep the salesmen away from the development else they’ll sell it before it’s developed, you know, so … quite a few – mostly those with interest in government that had installations in government establishments. Like Bletchley – not Bletchley Park, Cheltenham the – what do you call it, the shrink place at Cheltenham.

GCHQ?

GCHQ, yes. Which of course had been the customer for the Hollerith bomb machine … yeah …

Hmmm. What were the attitudes of the sort of engineery people you were with towards computers at this point?

Again it depended on the – the – the age and the background of the engineer. Those that had had forces experience were on the whole very supportive of it. Those that had been in punch card – died in the war, punch card engineers, not much – no, mostly they welcomed it, yes, it was something new, yes, they – keen to get on with it, a bit frightened of it of course, but then we had these multipliers in the field which were electronic and they’d been out in the field for four or five years and the calculators were just starting to be delivered, so electronics wasn’t entirely … a – a new bogie.

Hmmm. Talking more widely, you talked about visiting places like Cambridge and TRE?

Yes.
Could you tell me a bit more about those visits and what you learnt on them?

Not really, no ... not really, I can’t remember much about them. I remember visiting the Cambridge machine and thinking, oh my god, how the hell are you ever going to produce that? But having said that, that was a bad result on my part because of course Joe Lyon signed up with Cambridge and the LEO machine was developed from the Cambridge background, and very satisfactory it was too and did the lions job excellently, but expensive mind you, very very pricey.

Hmmm.

[05:51]

What were your first impressions of Doc Booth?

I got on excellent with Doc Booth and I think he got on well – well with me. We had – we were different people and we had – we were mutually tolerant of the other. I was a down to earth engineer whose job was to produce something that would work in the field reliably again and again and be maintainable, and that sort of thing. He was always pushing forward to the next, you know, what can I do next? He had marketed … a version of Apex and sold about three of them, well when I say sold he didn’t sell any hardware, what he sold was a kit of plans and there again he had minimised the – the drawing of these plans by adopting a series of symbols for – for the various circuit elements, so what would have been a circuit diagram a yard square, he reduced to about the size of, well, a tea plate. But excellent. How did I get on with him? He used to come and visit regularly when I was developing these things and say, ‘How are you doing?’ and so forth and I said, ‘Well I’ve got that working, that working, what do you think about that?’ and he’d say, ‘Oh well what I did was that that and that,’ so there was a lot of interplay. [Laughs] The … trying to get some of Doc Booth’s things into production, where you need drawings and specifications and tests was very amusing at times, one of the – the key things about Booth’s computer was it was based on a magnetic drum which was about the only method of reasonably cheap storage, electronic storage that – that was available at the time. The Cambridge machine used mercury delay lines which are not the sort of thing you want all around
an office for instance. The Manchester machines … used cathode ray tube stores which were … temperamental I think is the best word. But Booth’s magnetic drum based machine was excellent. He based the whole machine’s timing round the drum, whereas other machines usually had a – an oscillator which provided the pulse repetition frequency in the machine, that’s all very well but … with the magnetic drum, if the drum slowed down or speeded up, then the machine kept in absolute pace with that, whereas if you had – trying to transfer from a machine with a fixed oscillator to something with a – which had had a variable rate like – like a drum, then you’d had to build a buffer in-between and – and that would have cost money. So, going back to trying to get Booth’s magnetic drum into production, the production guys that were drawing up the plans so that we could make more of them said, ‘What about these magnetic heads?’ which were tiny little things about half an inch square with a little hole in the middle for a winding to go round and a – a small gap which – in the magnetic circuit which was where the actual recording took place. They said, ‘Well how do we – where do you get the steel from Doc?’ and he said, ‘Well I don’t really know,’ he said, ‘I just got it,’ said, ‘Well what did you go from?’ ‘cause they pressed him a bit on this, he said, ‘Well the – the Post Office engineers were putting up a whole lot of new telegraph wires down my way and the – the curved bracket with the screw on the bottom which held the – the insulator on the top, I hack sawed that up and made the – the heads out of that you see,’ and then they said, ‘Well [makes mumbling sound] but that surely they’re – they’re now made of new metal?’ ‘Yes, I’ve made some more out of new metal, but that has to be tempered. We’re trying to make an oven to do that in so we can do – control the tempering of this,’ ‘How did you do it?’ and he said, ‘Well like this,’ and he said, ‘got a Bunsen burner,’ and we said, ‘Yes, Bunsen burner,’ and he said, ‘Got a hacksaw blade?’ ‘Yes, got a hacksaw blade,’ and so he put the little recording head on the end of the hacksaw blade, put it in the flame until it was red hot and then gradually reduced it so that the temperature dropped nice and gently, he says, ‘Now try that,’ and of course it worked perfectly, so [laughs] – but trying to get that over into a production thing. But it – I’m just pointing out the – the curiosities of trying to interface a – a maverick designer with a – a production environment is – is interesting. But that’s where I came in, that’s where I came in, I was the buffer between the two, yeah. What – what else to be said about Booth? As a man he … desperately wanted to get the chair of computing at London University and his … you can call them colleagues at Cambridge, that was Booth, and
at Manchester which was F.C. Williams, voted against him so he didn’t get it, which hurt him greatly and I can understand – I can understand both sides, I don’t think Booth was an organisation man and would have run a large department well, now that’s a personal view. So Booth upped sticks and went to Canada and I’ve forgotten the name of the university he went to but it was in – in the middle of somewhere, and he settled down there and stole magnetic – sold magnetic drums and that sort of thing and yeah.

_Hmmm._

But of course the – the big computing world was rolling them, the vast IBMs and National Cashes and – or UNIVACs were going great guns.

_Hmmm._

[12:37]

*What sort of state was Booth’s computer in when you visited?*

What sort of –

*What sort of state was it in when you visited it at the barn?*

Which one are we talking about?

*The first one.*

The one at the barn … it – it was what it was, a prototype screwed onto … post office racks … it – it was what it was, it was a … a computer not fit for mass production but it wasn’t designed for mass production, it was designed by a university chap to do university computing on, to be maintained by some graduate who – undergraduate who was pushed into it and, yeah.

_Could you describe it to me?_
What, the – the machine?

_Yeah yeah._

Two post office racks with … what would you call them, must be a word for them, twenty-four inches by say ten inches, metal sheets in which all the – the valve things were – there were probably one two three four five six of those, power supply at the bottom, switch panel at the top so as you could set any number you liked into the registers, and magnetic drum on another panel. Got pictures of all these if you – if you want to see them sometime but it’s no good on this thing, you can’t describe a picture to this damn thing. What else? The valves were what are called B7G which are glass based valves without – not a plastic based valves, they were semi miniaturised they were a range of valves that the Americans and the Brits had produced – oh I’m going to shut that door – [break in recording] they had been used in large quantities –

_Let me just –_

They had been used in large quantities in the radar equipment and that sort of thing so the –

[14:37]

Ah, that was another point. I had … difference of views with … Wilkes because he – he … liked … new specialist tubes that people were developing, specifically for counting on, whereas I wanted a tube, a valve, that was in mass production and being made by the million, ‘cause that’s the way you get reliability and having been with Marconi Osram I felt very strongly that going for specialist tubes, which only a few hundred would be made, the cost would be high and the re – the reliability, which only comes by making thousands of the damn things, would have been available, so that was the engineer versus the – the academic.

_Hmm._
Are there any other real differences between academic computing in this period and commercial computing that were obvious to you?

Well the ones I’ve said, the most obvious one is doing it for a price and a cost and it’s got to be reliable. And it’s – the customer – the customer is not yourself as it often was in the university, the customer was a – an array of businesses out there, all of which had got different needs which had to be analysed and selected to do what the machine we were developing would want to do. So certain maverick customers had to be abandoned, you know, that wanted to do very specialist things like print on sheets of glass or something, or – or fly it or whatever it happens to be, yeah, go down a coal mine, yeah, there was always – there’s always the – the fringe that you – you can’t deal with. But having said that … both of my machines did meet their market needs excellently and they sold in very large quantities, yeah, more than the rest of them put together. Yeah. That was a short period, after that then the Americans were rolled in and several –

Hmmm.

What sort of applications were you mostly concerned with?

The – the two – the two … set applications of what you find everywhere, stock control and invoicing and payroll and they dominate almost any company you go to, or – or government organisation. There are all sorts of other applications obviously that – that got onto the computers now and again or bit by bit, but the – the – the basic business of paying your people and also deciding where your stock is, how much it is, how much to charge for it and billing your customers and ordering more, that is there all the time. There’s a third application which is manufacturing control in factories which I had at one time a little later on some programmers specifically evolving programmes for that, ‘cause British Tabulating Machine Company had huge factories
and knowing where the stock was and what it was doing was vital to them and one of my first machines actually went into the factory for that purpose, hmm.

_Hmmm._

[18:12]

_Could you actually talk me through a little of the process of how you take Doc Booth’s machine which is as you pointed out a prototype, not designed for production, and building a copy of it?_

Well building the copy is easy ’cause that is just building a copy, so you – you photographed it, you sketched it, you – you made lists of the components, ordered the bits … got the workshop to stamp out the chassis to mount the bases, no problem at all, all the bits were available on the market, there was nothing special, we’re not talking about the magnetic drum, that’s something yet again. But then when it came to production … the … what we haven’t been through is the different marks and arrays of the machine, so after the HEC1 … was built, then we came to a machine called HEC2 which … now I’ve got to be careful or I shall make a mistake … HEC2 was a copy of HEC1 because I’d had HEC1 taken away from me and taken up to London because the programmers needed a machine and that – that the salesmen need something to show, not that they were selling that, but they – it was desperate that they could say, ‘We too, look here it is, you know, we’re doing this and we’re right in there,’ though nobody would buy that. Then the third machines I built, it was decided, yes we would produce some production machines, so we produced a range of seven machines called HEC2M, M for marketable, right? So … the calculators had already got a kit of parts to make electronic machines where certain elements were plug – pluggable so that if you wanted to replace a – a count or something you could do that, you didn’t have to get a soldering iron out and service the – this machine that is all wired up solid, which you just can’t do in the field. So HEC2Ms were the same machine put onto mass producible pluggable elements, they were chassis that had been used in the calculator, with plugs each end and handles that plugged in four, ten – I’ve forgotten how many valves, at a go. So the HEC2Ms were machines that could have either a printer or a punch on the output, but not both. Also they were
essentially binary machines, though you could convert to – to – to decimal or – or Stirling – or – yes, decimal if you wanted to, but essentially they were binary machines made for the scientific market to get us out into the field, get some experience on them, get the field engineers learnt to – to service them, get a service organisation set up, get a – some customers that understood about computers, so that is why we built a small batch of scientific so called computers. They all went to … engineering or government departments. I’m trying to remember where they went. One went to GEC itself, ‘cause we had a link with GEC … one went to Boscombe Down, I think that was called AERE, it’s – anyway it’s on Salisbury Plain where they test new aeroplanes out. One went to ESSO Fawley, big refinery … that’s three. One went to … an aircraft research establishment somewhere near Bedford, which was a government one and another one went to another aircraft research establishment near Bedford which was a civilian one, and I’m trying – can’t – can’t remember what the names they were called, that’s five I think. [Laughs] One was ordered by the … Calcutta India mathematical laboratory and we shipped it out there and never heard of it again, but in fact they were a front for the Soviets and it disappeared into Russia, so goodness knows what happened there, but the Russians wanted one of everything, so – which was a great mistake on their part, they could have really – if they’d had concentrated on one line and said, ‘All the programmes are going to be compatible, that’s going to be the way it is, we can ship programmes we don’t …’ I mean they could have steamrollered ahead, but no they did what the west did, had one of everything and nothing was compatible with anything. And that stayed that way until IBM produced their 360 series, ten years after – later. Even inside companies that – that machines were not compatible. So going back again to the machines, we’ve now got six, we’ve got one going out to India … and the seventh, I’ve forgotten what that did, may have been – may have stayed inside the company, well anyway so that was that. Then whilst that was all going on I settled down with a dirty great drawing board to draw the machine up which had got to be the commercial machine and that had to have certain extra features that the others didn’t have. It must have a printer and a punch on the same machine so that the machine could produce payrolls or invoices, but it could also punch information that could be carried forward to the next run. There was no magnetic tape at this time, so there was no medium for recording the results of what you’d done, except punch cards and paper tape really that could be re-imported into the machine. For obvious reasons, we’re a punch card company
that’s why we took punch cards, and not only that, paper tape had not got the ancillary – a range of machines that supported punch cards, like interpreters and so forth, collators, sorters. ‘Cause the – the punch card evolution was amazing, they were absolutely remarkable machines, produced in large quantities all over the world, America of course and – and Britain in particular, thousands of then were made – tens of thousands were made in big installations, like an insurance company or government census department you’d have hundreds of machines in a room, all manned by masses of girls, punch cards being pushed backwards and forwards on trolleys and so forth. So going – going back to me and the HEC4, I sat down and produced the logic – the big logic diagram for the HEC4 computer … [walks away from microphone]. It censures itself, see.

[Laughs].

… [talking away from microphone]. There we are.

That’s a very large sheet of paper [laughs].

It’s a very large sheet of paper, but it’s all on there, the whole machine. Drawn tenth of the eighth 1954 … modified January 1955.

Sorry, just –

Sorry, better say that again hadn’t I? Well I’m looking at the moment on the – the large logic diagram of HEC4 which is all on one sheet and it goes – it has the whole machine on it with the – the central processor and all the arithmetic unit, and also all the connections to the inputs and outputs in the magnetic drum, so that’s it. And –

How does one start designing a computer this way?

[Laughs] How do you write a poem? You – in my case you took the HEC2 design, HEC1 design and expanded it and grafted onto it and all as different word length, it had a divider on, all sorts of other features and special conver – ah, because it was a binary machine every decimal or Stirling or pounds – or other radices that you want to
put in the mean [ph] has to be converted into binary, and also when it comes to printing or punching then that has to be converted back again. So I also designed special cir – is that in or not in?

*I’m not in actually [laughs].*

Oh that’s you. Okay … so the HEC4 has got special conversion programmes, not – well they are programmes really, they are the hardware boxes specially for converting any notation into binary and from binary back again into any notation. And what pre – preserved the British computer industry, or Hollerith for quite some time, was the fact that – that Americans, IBM in particular, couldn’t do Stirling, they – they wouldn’t make a special machine for Stirling – well for their damp offshore island, not worth it, you know. So we had a defence and I don’t know how important this was, but for sure the fact that my machine would do Stirling made it eminently saleable to – well about 150 customers, so it was a very well received machine. It bloody well should have been too because of course we had the biggest sales force, we knew all about industry and so forth, but on the other hand it did have to work and it had to work reliably and they didn’t throw it out ‘cause it broke – kept on breaking down, no, it – it did its job well and that was lovely. In fact it was more reliable than the equivalent punch card machines that it was with, because they were electromechanical and things. However, all your eggs were in one basket; the computer. With the punch card machines you could have three tabulators, four punches, if one of those broke down you had three still working, so the level of res – of reliability of the computer had to be higher than for the punch card machines, but – so then we buckled down to making the HEC4 in quantity. By this time … we could do it as the manufacturing units were set up for and that is with a preproduction unit, this means that the engineers like myself, the design engineers like this worked closely all the time from the word go with the production introduction people who came in with their – their – their know how which is, you know, how to press things out, how to solder, how to document, all this sort of thing, so that machinery was machinery … idea, concept, organisation, was – was what was used for HEC4. So then when it came to producing 100 of it you could roll it, you could roll it. But the engineer – me – the designer was long out of the – out of the picture by then, that was
done by the production – introduction people and the production people. It would be the same with a motorcar, you know.

**Do you still build a prototype then?**

Oh yes, so certainly yes, absolutely. Still build a prototype, but the production engineers were in there already and bits of the prototype were built by the production people anyway, so I could order from them so – so many of these, so many of these, so many of these to build into the prototype, because the HEC4 chassis and the HEC2M chassis were the same, these pluggable units, so yeah. Getting it from concept into production was shortened in timescale because, mass production, because we had planned this in early. But there would be acceptance tests effectively which I as the development engineer had to jump before certain bits would be signed off by – to go into production, quite – yeah, very sanely. The – a hectic time as you could well imagine because the market had recognised it needs computers, so there were all these – these commercial salesmen out there, not really understanding computers, having to sell to customers who didn’t know about computers, so it was a terrific learning curve for everybody. It was surprisingly painless though, there weren’t any as far as I know – can’t think of any great hiccups like you get at the moment with – it’s amazing to me that, you know, that the introduction of … large software systems like the National Health have just had one, we didn’t have that problem then, it may have been ‘cause it was so much smaller. On the other hand it was new wasn’t it and you couldn’t say programming was new now could you?

[33:18]

*How did you actually programme one of the early HEC machines?*

Oh [laughs], the hard way. You programmed in machine language knowing what the machine did and what – what relays and what shifting registers and switches and – were doing the work, you actually understood what that box did, whereas in later generations of computers, there were operating systems and – and assembling languages like FORTRAN and – and so forth where you wrote in a language and you didn’t understand what the computer did internally, you never knew, you still don’t
know, you just programme in a language and then there’s an interpreter that converts it into the particular piece of hardware that you want to run it on. So that wasn’t so, that was a later part of the computing business. No, in the early days of computers, the British Tabulating Machine Company would programme – would … train programmers for the customer. We would run courses and they would take away their machine and do their own programming for it. The programming was done on punch cards, you had a pack of cards you fed into the machine which loaded up the drum with the – the programme, there was a starting point, you went ding and away it went with luck, with luck. But … my sense of awe and amazement at the speed that it would do things in was interesting. We take it so much for granted now, but if you had worked with punch card machines, or these Brunsvigas just turn the handle, but [makes pinging sound] [doyng] and there’s – there’s a ten – a ten figure prime, just boing like that, it – it just – unbelievable. I – took me some time to get over my amazement at the speed of this box. Incredible.

*How do you build a prototype computer from those plans? I can see the plans, I can think of a prototype computer sitting there, I’ve – what’s the step in-between?*

… Are we talking about the prototype or are we talking about when it goes into production?

*Let’s talk about the prototype first.*

Right, okay. Well [dog barking] each one of those symbols on that logic diagram you saw here has a physical representation, that would be a separate little diagram which would show a valve with the resistors and the capacitors connected to it. A draughtsman, I mustn’t say draughtsman else I would date myself, would take that logic diagram and a line would have been drawn round a bit of it and he would say, ‘I – I need five plug in chassis to do this,’ and then he would translate the symbols of a gate or an Eccles Jordan or whatever it happened to be, into the actual resistors and capacitors, and draw it on a plan and then the physical bits would be available and known, ‘cause they were sort of semi-standard, and then it would be given to the production department, pre-production department where they had girls with soldering irons, who would then build it. And I wanting that would breathe down
their necks to make sure that I’d interpreted correctly and they were doing it correctly, and then they would say, ‘We’ve done that chassis,’ and then I would give that chassis to one of my assistants, my engineers working for me, and say, check that out will you, and so he’d – what he’d do first of all he would go over the diagram, checking every joint and ticking off the diagram to make sure they’d all been soldered and were there and often there weren’t, you know, one hadn’t been made and so forth. Then he’d probably join – put power supply onto the thing, with just the heaters to see all the valves lit up happily and that wired through. And then he’d put on what’s called the grid bias so that nothing – everything came down and he checked through that that went through. And then he put on the HT which is the main high – high voltage line, and then … many of the Eccles Jordans in the machine, flip flops, would have a little neon attached to them, which was – which very much like the little neon’s we’ve got in these things, which would glow. That would be away on a control panel somewhere, but at this stage you were just on the bench and you’d say how to get it working. Well, you would go around with a – with a volt meter or – and prod around and make sure that everything went, you might hang on a few neons to see it was working. In particular the things called shifted registers which are a whole row of Eccles Jordan’s – Eccles Jordan mean – Eccles – no, no, there’s a thing called a flip flop Eccles Jordan, bipolar – bi-state circuit which is either in the one state or the nought state, you have a row of these for a so called shifting register. Supposing the length of the word is thirty-two binary digits, then interconnecting this row of thirty-two bipolar flip flops, as they’re called, would be shifting circuits and by putting a pulse on the shifting circuit line, what’s in Eccles Jordan One goes into Eccles Jordan Two, what goes from Eccles Jordan Two goes into Eccles Jordan Three and so forth, so the thing goes chug chug chug chug, so you can put numbers in at the beginning, say from the magnetic drum and they will chug chug chug in there and at the end you can take the numbers out and chug chug chug chug back onto the magnetic drum. And because the whole machine is timed for the magnetic drum, there’s no argument about, you know, is the digit ready or have we shifted too early, Booth timed the whole machine from the magnetic drum and that’s – was how he did it. So you could check out the row of the Eccles Jordan’s like this, so the chassis would get tested one at a time, then you would come to the more difficult bits, such as the logic where there’s the adder and the subtractor and the tester and all the other little bits, the write and the read. All the functions, a computer has a number of functions and the
function list determines its properties. I can’t remember how many – I could look it up easily, of how many functions the HEC4 machine had, but there’s – let’s say it was probably twenty. So each one of these twenty functions had a little circuit which did add, subtract, shift, whatever it – as you wanted it to do. So you – you would build the whole thing up and having got the shifting registers to work then you would start testing the functions one at a time. You probably wouldn’t have the drum at that stage, you can keep that offline and then when you got the bits actually doing what you thought they should do, then you would join up the drum and start to try and record to the drum and then recoup – read off the drum. Between the drum and the computer was a thing called track select, because there are sixteen, thirty-two tracks, depending on the size of the drum you had to switch to the right one and these were relay tracks, and that was the one area where the relays were an electronic circuit which is not a good thing but there was nothing available at that time to do this track selection other than relays, and you wanted to do it very quickly ‘cause it’s actually in the computing circuit. So Hollerith had a thing called an MSM … Multiple … ah, can’t remember, anyway it was effectively four relays all joined together and they moved together. And so knowing that relay contacts were a bastard and always gave trouble I doubled up on the – the number of points to each track, so if one went the other one went. That worked all right … however it was a very sensitive low voltage area ‘cause you are now reading many volts off – off the drum and so it was very susceptible to interference, such as somebody welding next door, or even somebody – a flash of lightning, or even a light switch, so it all had to be very carefully screened to stop pick up from external fields onto there, the – the mains into the computer also had to be screened. What else do we want to say about all this … can’t think of much else.

[Laughs] How does it take shape, what’s –

Well bits get added on and so until it’s all built up, yes, as I say you start from the – the bits that work. As far – having said that however there’s – there’s a lot of circuitry in the tabulator and the punch, because they do certain things they’re best at doing, which you would not hand back to the computer, you would leave the tabulators and the punches to do the things that are their forte, and such as reading and punching cards for instance and printing, and in that process the tabulators had got various
methods of control from holes in the punch card, which come – come from history, you know, the hole in that point will make it do that and so forth. So you could test the tabulator and you could test the – test the punch offline, not connected to the computer, and you would … the – the very skilled development personnel who developed punch cards would – would do this for me so I’d get a – a tested tabulator to join on or – or tested punch to join on. And that was just – that was child’s play to them ‘cause it’s what they’d been doing for years and years and years, and very good they were too, excellent chaps. Interesting though, they were horns handed sons of toil, they were chaps that had come from the local school and they’d – they’d had their apprentices and gone through the – through the – to the – through the – the mill, through the factory usually until they – they were chosen ‘cause they were bright and they would be put onto this sort of work. On the other hand, on the electronics side, quite a lot – a lot of people were coming in, most – a lot of them from the forces who’d been in the air force or the army to work as service engineers on the electronics and so forth. So there was a mixing of these two types of people and they got on well together and there was never any friction that I know of, yeah. Well there might have been but not – nothing serious anyway.

_Hmmm._

[45:11]

*How much was the need to actually incorporate this – this punch card machinery – something that influenced the actual end to the day computer design?*

Vital, ‘cause our customer was a punch card user and he had a room – rooms, factories full of these bloody machines and this thing had to got to go in there and phase out the punch card stuff onto this machine, so the use of punch cards and – was dominant, if the computer couldn’t read punch cards and do what the punch card installation, what it – it wasn’t – it wasn’t in the running, if you can understand. Whereas you took and took it into a university for the lads to play on, that would be a different story, quite a different – different field.

_Hmmm._
But all over the world there were large companies, any large company had a punch card installation, either a Power Samas or a Hollerith, and so that was the market that these machines went into. And seeing them stream off the production with names like Hobart or – or Cape Town or Ottawa, you know, you just suddenly realised what you’d started. [both laugh]

[46:31]

We talked a bit about how you built the prototype computer then, how do you build an actual production line one in comparison?

Well I don’t, there’s skilled people whose job it is to do that, and because they produced … these multipliers and these calculators and were producing these multipliers and calculators, they hadn’t stopped going, these – these were – still got their uses, very much so. This was just yet another machine, and being a production organisation it would have written tests and procedures for anybody to – not anybody but the skilled people to pick up and do, so the jump was not as difficult as it sounds. In fact I don’t remember any horrors ‘cause they were first class people and been doing it for years. And of course we used wherever we could standard mass produced components, resistors, capacitors, switches, plugs, sockets, wire, that sort of thing. So they were all available from the suppliers who were beating on our door saying, you know, ‘Do you want to buy this?’ you can imagine. So no, it – that was not a problem, that was not a problem.

Hmmm. Sounds a lot like the machine is basically built around a drum?

Yes.

Would I be correct in saying that, it sounds like it’s a very sort of central component that –

Righto, let’s talk about the drum for a bit. Punch card machines store the information for next week or next year or the library that bring forward information, the past
information, on punch cards, boxes upon boxes upon boxes in rack upon rack upon rack. But they’re slow, they are slow, so trying to have a store which was punch card machines – which was punch cards was just not on, you had to have some – not only to store the programme, which you wanted an instruction every one and a half milliseconds, which you couldn’t not do on – on punch cards, the carry forward information and that sort of thing is on the drum. So the drum is used for two things, the programme and – and data and number storage. It isn’t however big enough as when magnetic tape came along to substitute four punch cards, so things that were going to be carried forward to next week had to be put onto punch cards with this – this HEC4 machine. It was only when magnetic tape came along that you didn’t – that the punch card carry forward information was – was not required, it could go on the mag tape. Does that answer it? Oh no, you want to know a bit more about the magnetic drum?

*I was – how the magnetic drum functions as part of the wider machine, because you were talking about things like timings and so it sounds –*

Okay, yes, very fair. Magnetic drum is – is almost self-explanatory, it was a drum of about eight inches diameter by about two inches wide, and the surface of this drum was coated with magnetic iron oxide, very much like the stuff that goes onto magnetic tape, feroxide if I remember, and … very accurately produced so that when the drum revolved the surface didn’t vary between that and a reading head very very much, I couldn’t tell you what the – what the precision was but pretty pretty high. So the drum, again due to good old Doc Booth, was a cantilever drum that the axle stuck out one side and heads recorded onto that. It did not have an axle that went right through onto a frame with bearings both ends, and then a frame round on which the heads were. The reason being that the thing that upset the magnetic drum most was expansion and contraction of the metal with – with temperature in the room and the heat of the machine; if it had one – one bearing on one side the drum just expanded straight out and – and the heads moved horizontally outwards and kept in line and no problem, but if you had bearings at both ends and the sort of u-shaped bit round coming up with the heads on it, then the tendency was for this to bow out or move inwards, rather than to move linearly. So the Doc Booth concept of a cantilever drum was – was superb. We had to go against that later on when machines got bigger and
the – the – that wouldn’t work. So then you had to semi – temperature control the – the drum housing and that sort of thing. Right, so the magnetic drum revolved and by the time we got to the HEC2M the clock track – clock track, I said the whole machine worked from the drum, so recorded on the drum, or engraved on the drum you had a series of blips all around which were the clock track and you amplified that with a little head and that was the main timing for the whole thing, thirty-two kilocycles per second was the speed of the HEC2M … this clock track then was read off into the main machine, went into a counter that counted down to thirty-two and at the end of thirty-two it gave a pulse out and that was the word pulse, ‘cause thirty-two bits was the length of the word. So round the drum you had sixteen words, 512 bits and each thirty-two bits round there was a separate word and so the – the clock pulse came off and provided that thing. The heads that recorded or read off the information on there in Doc Booth’s sensible design was the same head, he didn’t have a multiple head, one for reading and one for writing, the same one was used. So, there was a very powerful amplifier that when you put a pulse into it gave a – a strong pulse routed to the correct spot on the drum via the relays, that recorded a one or a nought, so you recorded all your numbers like that. When you wanted to read you switched that thing – that pulsar off and you switched on a read amplifier, much more sensitive amplifier as you would get in a tape recorder or something like that, that – that amplified the – the waveform off the drum and then you strobed that with a clock pulse which was exactly in line with what was on the drum ‘cause it was put on with the same clock pulse, so there was no mis-timing, and you strobed the waveform off the drum to discover whether it was up or down at that point and therefore whether it was a one or a nought, so that’s how the – the drum worked. So … an added development which we used in the HEC4 was that … when you read – sorry, recorded on the drum, you couldn’t read immediately afterwards because everything was jolting up and down by the big voltages that had been flying around, so we … used a clock track on HEC4 which had a gap between words, so it wasn’t a continuous 512 pulses, it had thirty-two gap, thirty-two gap, thirty-two gap, which enabled you to do things in that gap time and get the next word out, whereas in the old HEC2M you had to miss a word because everything was jolting around and you couldn’t get it off. What else to be said? [pause] Drum you said drum … in later machines we did get round to not having relay switching but electronic track reading and what have you. One of the snags with the early machines was that because it took time to be able to
get the next word, you haven’t got time to get the next word, you could only get alternate words off round the drum, and also when you did a track change from track two to track three, the relays were jangling up and down for five milliseconds or so, so there was a gap before you could get the next word off. There were interlocks to stop you trying to do it, you would – you would then be made to pause till the time was right to come round, but that wasted time, so there was a process called … optimum programming, which meant you put the numbers and words on the drum where they would be just coming up when you need them to be, which was a damn nuisance, but it – that – that was one of the prices you paid early on before we – we got these other things I’ve been telling you about to make them less necessary. And that was one of the – also there was little programmes developed by the programmers when they started to help them with this optimum programming so it – it – it sort of told them what the next word available is if they want to put it there.

*Hmmmm. When did programmers and software people, when do they come into this?*

Let’s see what the time is? Three o’clock, you want to go at four ten, four five?

*I think if we wrap up about quarter two that’ll give me twenty, twenty-five minutes to catch a train.*

Three quarters of an hour to go. Cup of tea, no? All right, okay. I will – as I want a cup of tea anyway.

[End of Track 8]
So when do programmers and software people come into this story?

Right, when I started at BTM and started to design the – the first machine, the HEC1 which was Booth’s machine with input and output on punch cards and that sort of thing, we had two … vac students, and one of them called Harold Ashforth became the first programmer, he didn’t realise he was the first programmer, but he was the first programmer. So they came in at quite an early time but they had to know the machine intimately, what it was and where all the – all the – the machine – the pulses went whizzing around … later on, as I say, programmers never knew – know now what’s in the machine, don’t care a damn what it is, they’re using this language, like FORTRAN or whatever it is these days, to put the programme in and then a compiler does that for them and yeah. But at that time machine – people were programming in the machine and the customers were also programming in the machine when we started to deliver HEC4s. So the customer would draw up a flowchart of what he wanted to do, we – the British Tabulating would have trained him, he’d have been on a course, he’d have been given sets of cards and charts and all the sort of help that we could give him, so that having done the flowchart of what he wanted to do, he would break that down into card input, calculate, punch, print, whatever it was, and each of these would be programmed on punch cards, he could then test them by putting them into the machine and one shoting, yeah, there was a switch on the machine that did one word operation at a time, so he – each instruction he could go, click click click and he could look and see what the numbers were on the registers, ‘cause there were little lights all along these things which showed you whether it was one or nought in all the positions, so he could see and check his programme step by step, so that’s what the programmer did. Then obviously Hollerith got clever at this and said to the customer, ‘Well we’ve programmed this for you, it’s a universal programme, here it is, there’s some cards, that’ll help you with the input, or that’ll help you with the output,’ or whatever it happened to – and then we started to sell applications like payroll, stock control and we had groups of programmers in London programming these things up and so we would go to a customer and say, ‘Here is a stock control programme, here is a payroll, already done, now it’s got variations in it which you can
choose which you want to do and – and it’ll get you off the ground,’ so that’s what happened, that’s how the world started to programme.

_Hmmm … go._

Right, you wanted to know how machines got their names. Well there was a – a committee yet again, well not yet again we didn’t have too many committees, but there – there was an organisation in head office that controlled nomenclature, documentation, release to customers, all this sort of thing and they … decided that the multipliers had a series of numbers, the calculators had a series of numbers, the computer must have a series of numbers and we decided it would be the 1200 series, so that … donated computers. So the HEC2 … the HEC1 and HEC2 and HEC2M were 1200s. The … I’m – I must check this later on, but the – because I always think of the HECs and I don’t think of the other numbers, the … HEC4 became the – the 1201 and then another version of the HEC4 became, with a bigger drum or something, became the – the HEC2. So yeah, HEC1 HEC2, yeah. HEC1200, 1201, 1202, yeah.

_Hmm._

So if you look at the documentation the ICL documentation, the ICT – it will have the 1200 series, you won’t see the word HEC on them.

_Hmm._

[04:48]

_We’re talking a little bit about customers and programming as well here._

Yes, yes.

_I was thinking, what sort of contact do you get with the people who are using your product at the end of the day?_
As little as possible [laughs]. Let’s say – no seriously, development engineers and the customer don’t mix, the development engineer is five years ahead of what the customer is now getting, three years at least, so what I’m thinking in my brain now for the future machines I’ve long forgotten and handed over to the experts, which I’m no longer the expert, in getting these things into the customer’s office and getting them working and getting them programmed. So they would talk to – to the – the support staff, and very good they were too, that would hand hold the customer in his troubles, yes. Only when a … a universal, that’s too strong a word, a problem that interfaced back onto the machine of such a nature that it required a machine modification would it come back to me. And then it might not even come back to me. The machine having gone into production, the production engineers would be responsible for it, so if somebody came along – along and said, ‘We want an extra light to show this, we’ve got to have it,’ the answer might be two-fold, one you might – no, three-fold, one you can’t have it, two we’ll do a special for you and it’ll cost you this much, or yes we’ll put it on the machine – all the machines. So – but that wouldn’t have been in my field. Because of course … the input output bits varied because they had an evolutionary process in them as well, particularly the tabulators, you could have almost any – well different tabulators on if you wished, you’d had to pay for it.

Hmm.

[06:45]

So what sort of – what are the important factors that drive you from one computer design to the next?

Curiosity, market pressures. But no, you want to do it, you want to be there, it isn’t that they’re forcing you to do it, far from it. Most development engineers get fed up with the machine they’re doing now, ‘Let’s get on with the next one,’ and, you know, you’re – you’re kept with your – on the whole though the company has got a strong vested interest to get it out of the hand of the developers and get it into production. ‘Cause the bloody developers like me would want to alter it all the time, ‘Well we can do double that speed now, but if you’d only let me do this,’ and somebody says, ‘Now stop boy, we’ve just got to get that out into the field, get some money back and satisfy
all those customers, we cannot allow masses of variants and – and enhancements.’
But on the whole it – these HEC machines did not have great numbers of
enhancement or variants. In fact I’m trying to think very many – few of them, no,
can’t think of any. The tabulator could be varied because that always had to be
variable, so if a man comes along and says I want to print my company logo on the
top right hand part of my invoices, then we’d say, ‘Yes Sir, yes Sir, we’ll do that for
you but it’ll cost you X’, you see, or whatever it happened to be. So yes, the
tabulators would be variable. Some numbers might never come back into the
computer, they might be kept in the tabulator for some reason.

_Hmm. So –_

Oh just one again, also the company had a specials department which dealt with these
things, if a salesman could flog a machine but it had to be a special then he could go
to the specials department and they’d give him a quote, which usually frightened him
so much to death he went back and sold the right – the – the basic machine. That’s a
joke.

_Hmm._

[09:02]

*How much freedom and control is there over what you’re working on?*

Depends on where in this evolutionary cycle it was, in the beginning I had _carte
blanche_ and they just trusted me, ‘What can we do to help you?’ and they – much –
the trust was not – you know, abused, no, I – I … I – I, we, were so motivated by what
we were and so interested in it that yeah, went beautifully. There was always the
salesman at the door saying, ‘Show me, show me, I’d love to see what you’re doing,
aren’t you a clever lot, it just so happens I’ve sold one,’ you know [both laugh], who
had to be pushed back into his place. Let’s just think what else … Hollerith which …
had been very much an aristocratic board of directors with horny handed sons of toil
doing the work and not much interplay between – evolved remarkably quickly into
being a technocratic company with technocrats in the – in the – on the line-up,
programmers, engineers, what have you, ‘cause it expanded so rap – rapidly. Also we had – which we haven’t yet come to, interfaces with places – companies like GEC, which is the – the next phase on the – on the development line.

_Hmm_.

But –

[10:43]

_Sorry, technocrats, could you unpackage that a little bit?

Technocrat was just a … an okay word I used. Engineer, scientist, anybody that is … skilled and trained … with – with what you call it, a mystique, he’s not an aristocrat that’s been put into the scene because daddy’s in there, you know, and so forth, which we did get a few to start with.

_Hmmmm. What difference did having technocrats at the helm make?_

[Pause] I won’t answer that because … many of the people that were already there were essentially – were technocrats ‘cause they’d become skilled and worked they way up to whatever it was they were coming to do. No, I don’t think – but of course once the computers came in, then the world was changing all around and so bright boys either coming in or already there built up their – their bits or their empires, what have you, yes, it was a – it was a vast changing world, and staff evolved quickly. But having said that of course the opposite thing was happening in manufacturing, that the – the electromechanical machine makers with their vast machine shops, take Northern Ireland, Castlereagh where the night watchman had to go round on a bicycle, you know, it was quarter of a mile long, millers, grinders, what have you, they all become – become redundant. The amount of metal cutting went way way down when the punch card went.

_Hmmm … hmmm._
Did the company itself change, how did the company itself change with the punch card decline?

Well the board of directors during the punch card era were gentlemen of leisure, some of them, some of them were – worked in the company and had grown up in the company, but they were usually – yes, they were usually aristocrats of some sort, but then come the computer revolution, then bright salesmen went up the tree, people came in from outside and went up the tree, it became much much more open, much much more open. And then there were mergers, of course that immediately caused a great big fight, but I can’t tell you much about that because I wasn’t – I wasn’t really concerned much with the mergers. But blood was all over the place in the mergers.

Hmmm.

Because there were two people for one job or – in many cases.

We’ve talked a little – well your – BTM’s great rivals Power Samas came up a little while ago when you were talking about the Business Efficiency Exhibition.

Yes yes.

What were they doing there?

They also had electronic development people, based in a place called the Mountain Pools at Whyteleafe where there had been exactly that, there’d been some mountain pools, there’d been some swimming pools which as a – just out of sheer coincidence I was brought up near there and used to swim as a child there, but then that was taken over and became their development laboratories, and … it would be unfair to me to really comment on that but … whether it was because they were evolving from round holed purely mechanical machines or whether it was the staff they’d got … they
regrettable failed to produce an equivalent range of computers that could … fight against the Hollerith range, and they did however sign up with Ferranti and so Power Samas were selling Ferranti machines but … there was no small machine, they had not got a machine of the same size of – as the one like the HEC machines. They’d got large machines of which they might – Ferranti’s and them together might sell ten, fifteen, that sort of number. There was the Pegasus machine which wasn’t that big but it was – and that went out. I am not fit to talk, you would have to talk to other people about that. Because of course there were also Elliot out there, there were also Metro Vic out there, there was Plessey out there for a time, oh who else was there out there? A whole number of companies that were selling one or two machines, mostly big machines like Atlases, huge Atlas machines for – for people like Aldermaston.

I’m just interested in sort of, you know … why – I understand you can’t talk for all these other companies, but I’m interested in where you would put your working relation to them, un –

I had prac – I was – got walls around me, I – I was a development engineer developing machines. Yes, of course I had some contact at exhibitions, at lectures and that sort of thing, but on the whole very little, very little.

Hmm.

We some – oh and of course also we sometimes recruited people from them … but the same thing happened in America as happened here, that BTM came to dominate the – the small to medium sized computer business, and in the States IBM dominated in the end, though they were slow off the blocks in America, very slow off the blocks. But a first class company but a – a shower of bastards.

Hmm [laughs].

[17:28]

We’ve talked a little bit about industry but I’m wondering what contact you had with the academic computer world?
None, they were passé, absolutely passé. Once this started to roll, I mean they – they weren’t anywhere. They were just playing around finding out the biggest prime number or something, no I – no – practically no contact at all with the academic world. Wilkes, very sensibly and very well ran a series of symposia in the early days at Cambridge which I went to and anybody in the computer industry could go – well interest you see there hardly was an industry at that time, we used to go along and – and listen to these lecturers and jolly good they were too, yeah. But – they got – obviously got to the stage where no longer could they develop their own machines, they had to buy them in from Ferranti’s or whoever it happened to be. And of course Ferranti did very excellently in that – in that field.

Hmmm. Can you tell me a bit more about these computer symposium then?

More about?

These – this computer symposium, I’m just –

Oh in – in – I can’t remember – remember very much about it, but it was held in the mathematics laboratory in Cambridge which was in rather dingy premises. In the – in this premises all – was the – what was it called, Apex, what the hell? No no no, forget the –

Cambridge machine?

Yes.

EDSAC?

EDSAC, EDSAC was there, which horrified me when I saw it … it was … I mustn’t be scathing about it because it was ahead of its time, I – not fair for me to say what a terrible thing it was. For instance though, the wires – no, very sensibly in a way but it couldn’t have worked [laughs] in any other organisation, the wires between the bits of the computer were right in mid air and far apart because they had worked out that if
you did that then the capacitance of those wires, one to another or one to earth were very low, so you could put high frequency pulses over and they wouldn’t get in there, so you got a bunch of those wires and made them into a – a cable form and Hollerith worked on cable forms, all their machines had large cable forms that connected [inaud]. If you tried to do that, hopeless, you’d get so much interplay of pulses between neighbouring pulses and reduction in the pulses’ power by capacitance to earth that it just wouldn’t have worked. So to build a demonstration machine under the circumstances they were, it was a very good decision, but it was not translatable in that form to a commercial world. However of course, Joe Lyons very bravely came along and, far ahead of their time, and said, ‘We want to count the hot cross buns by a machine,’ so they copied it and built a very good machine, LEO, excellent, which I – I visited and saw – used to see. But again of course it had mag – mercury delay lines which were something that couldn’t really have in a – every … factory. But the man, I’m trying to think of the name, who was the boss of LEO at the time was very farsighted, saying, ‘These computers will do the sum I want to and I – and I’m going to set up a place which will develop them,’ that – I can remember some of the people there, like Caminer was one of them, Kay was another. But I can’t remember any of the other … yes, just one moment, Pinkerton, John Pinkerton was there, but the boss man I can’t remember his name. But anyway it was – they were a remarkably farsighted company.

When did you have contact with LEO?

I had contact with LEO ‘cause they wanted a punch card machine input and output, so I went along to advise them, if you have this, this is what you do. And they were first class, I could talk to them, you can’t – not many people you could go into and they would speak your language and you say, well you – ‘I suggest you – you take the outputs from there, feed it into there, then you need a control pulse from there and do that, and by the way I wouldn’t – this thing sparks like fury, you’ll get pick up, I suggest you screen that,’ you know, all that sort of helpful advice that I could give them they just soaked up and – and no problem, took it and - they were a good – good lot.

[22:25]
How many women are in the computer industry where you’re working by this point?

None I’m glad to say. Next question.

I mean you mentioned one or two in places like doing the soldering for instance, I’m –

[Laughs] Yes I – okay, back to sanity. In the development phase … the only woman was an absolute disaster, I was telling you about this chap Harold Ashforth who was the first programmer and we had at that time another girl – so a girl … vac student working who fell madly in love with Harold Ashforth who didn’t return her … affections, and she then became mentally disturbed and haunted him for years, it really was extremely sad, very very sad, there’s – there is a word for it but I’ve forgotten what it is, but it was – it’s a mental condition, such a sad because, you know, by this time he was married and everybody knew about it but she had to be sort of led back home and, oh, very very sad. But this is no slight on – on women in the business, women in the business when the – when the computer side they did – programming side did very well indeed and there’s – yes, no problem. But on our development side I can’t remember any. Yes, there were ladies doing the – the wiring but that – and some girls in the – in the drafting – drawing office I think. But that’s all I can remember.

While we’re on this subject –

And the kitchen.

While we’re on this subject, what about GEC, was that similar?

Oh yeah, shall we leave that till next time? Right. But I’ll – I’ll give you the background so that you can – you can plan for it. Right, so HEC4 was launched and – and going reasonably well, but then … there were certain dis – distractions on the Hollerith side, we’d merged with EMI who’d bought a – who had a machine designed but we didn’t produce it because it was yet another distraction. We were trying to develop a machine with an American company, which I can’t remember at the
moment, which was also an absolute disaster and menace. So our large machine end of the development range was not filled, or satisfactorily filled. Then GEC came knocking on BTMs door and said, ‘We’ve just lost a contract for a government development laboratory at Pyestock,’ which was a … gas turbine development if I remember, ‘because we hadn’t got a computer, you have got a computer, we would like to liaise with you so that we can have a computer in our range,’ and then we said, ‘Well it’s funny you should knock on that door, we’ve tried to get bits of our computer mass produced for us in large volumes by Plessey, but it’s been absolute dismal failure because Plessey promised us that, yes, we’ll build this like this for – for two and sixpence,’ and absolutely grand, but then we had to say, ‘Oh by the way, we want that sort of switch there and we can’t have that any longer,’ ‘Oh that’ll be seven pounds two and four pence for this mod,’ and the – the cost of mods completely outweighed the low cost quoted for the original production. Nobody’s fault on either side, the – the Plessey people were doing it as they knew. They could produce something that was – that was set in – in concrete and – by the million, but once you started to put little variants in it then the price soared up. So we wanted to – somebody that knew how to produce electronics and GEC thought they did and GEC thought that we knew about computers so the two companies got together and formed a company called CDL, Computer Developments Limited, and I was nominated with one other chap as the BTM … starter-upper of those – and I – I suggest we do that next time ‘cause that’s another long story.

Okay.

[27:18]

I meant to ask you actually as well about your PhD which –

Yeah.

How did that come about?

That came about ‘cause I wanted a PhD you see. As I remember this – I was telling you about this bloke Willis Jackson who was a professor at Imperial and I said, ‘I
want to do a PhD,’ ‘Yeah sure, come in boy,’ once I was in he said, ‘I’m sorry PhDs are now three years and not two and you’ve got to do an extra year because you’ve come out of the forces,’ and so I just gave him two fingers and – and left, having got an MSc. So I wanted to do a PhD and Doc Booth was our consultant and he was at Birkbeck and they were used to having external students, a fact that I – you know, hadn’t really registered. So I said to Doc, you know, ‘I’d like to do a PhD,’ ‘Yeah, no problem,’ and I said, ‘Well I can’t spare the time to do four years,’ ‘You won’t have to do four years, it’s only two because you’ll be an internal student,’ but I said, ‘I’m not, I’m here,’ he said, ‘Oh yes you are, you’re my internal student,’ so thank you very much so I said, ‘Well I can’t come up to London because it’s a long way,’ ‘You won’t have to come up to London, you can stay down here and do it,’ and I said, ‘Well what shall I do it on?’ he said, ‘Well the HEC4,’ and I said, ‘Is that good enough?’ he says, ‘Yeah, it’s – it’s good for two or three PhDs,’ he said [laughs] so I said, ‘Well what do I do?’ he said, ‘You write that up and I’ll have a look at it,’ and that’s exactly what I did. So that worked very well indeed. But I’ve told you the – the funny story haven’t I about the interview for – for the –

You haven’t told me on tape, you have – you have over lunch one time.

I mean – yeah, okay. But having submitted my PhD thesis you then have to go and have your viva, they the – the interview, the – a front of – some external people, not just your supervisor, so there was Doc Booth, there was a chap called Professor Porter and there was Wilkes. Porter was the chap that was the boss of Aldermaston if I remember, I may be wrong on that but anyway, very obeying man. But Wilkes and Booth did not see eye to eye, to say the least. So I duly turned up – and university building, fifteen storeys, right up the top, sitting in a long long corridor on one little chair and they were in a – an office right down the end, and I sat on this little chair, I sat on this little chair and the time went by and then Wilkes came out scowling, walked straight past me to the gents – back again, back into the room and I thought, Christ, what have I done now? Then the next bloke that came out to have a pee was Porter and he says, ‘Don’t worry, it’s quite all right, we’re nearly ready to see you,’ so he did the same, went back in there. And then eventually Booth came out, grinning all over his face, ‘Do come in, sorry about this,’ so then I sat down in front of them and they said, ‘I expect you’ve been – been a bit worried as to what the delay has
been,’ and I said, ‘Yes, I was a bit,’ and he said, ‘Well we were arguing about whether your thesis should have been in the faculty of engineering or science, we have decided that engineering was the right faculty, so we’re quite happy to proceed on that grounds,’ I said, ‘Thank you very much.’ And then I – then I – and then he said – and they said, ‘Have you any questions?’ ‘Not on my side,’ and they said, ‘Well we haven’t so go on – [laughs],’ so that’s that, that’s how it happened. So they quite exhausted themselves on their – their – their academic arguments as to what facility – faculty – it is an engineering thesis, it is not a – not a science thesis.

How would you define the difference?

Oh, yes, engineering is things that work. Science is the theory behind it. Now that’s – but that’s roughly what it is. There’s a practicality is the engineering side.

Hmm.

Yeah, anyway, that was good.

Did having a PhD have any consequences for your career?

No, none whatsoever as far as I know, nor did my MSc. No, I – who knows, whoever knows but I do not believe that for career progression at my time it meant – meant anything, ‘cause I was working for this firm, I went on working for this firm, they knew me inside-out, the fact that now Dickie Bird’s got a PhD, so what? You know, it was – not – not a factor. If I’d try to leave or do something else then it might have been a factor, that’s all I can say. Right, well you want to get on a – a train.

Hmmm hmm. I have two other very brief questions if – I think we have a couple of minutes.

[32:21]

I was wondering about this HEC computer that ended up in the Soviet Union?
Yes, I wish I knew too [both laugh]. I’ve told you all, I don’t know. I can’t tell you where it went or why it went there, or what they did with it. No.

_How – how do you know it ended up there, was it just –_

Because the people in – in Calcutta said it’s gone to the Soviet Union, that’s [both laugh] fair enough. I wish I did know, I wish I did know, but the Soviet Union was – apparently was a free for all, everybody wanted a copy of somebody else’s machine, so add machines kept drifting – and of course there was sanctions, that was the reason it had to go in by Calcutta, that there was an embargo on importing things that could be used for military purposes to the Soviet Union. And because my machine I presume was full of American bits in various ways, I don’t know, that would have stopped it, I don’t know.

[33:21]

_Last question, what sort of support mechanisms do you give the customers of these things, apart from the programming you mentioned, is there anything else?_

Well yes, first of all the bosses want to know what this computer it and what it can do so you – you introduce them to it. Then you introduce the department that’s trying to use the computer as to what a computer can do, then you say, ‘We’ve got these applications that may help you,’ in fact you may have sold the machine on the basis of the applications, on payroll or what have you, and so you persuade they don’t have to – to do all the programming themselves. Then they wake up to the fact that their job isn’t quite the same as – as this standard job you’ve got so they have to produce some programmers to do that. Then before the machine is delivered they can bring their programmes along and try it on the – on the machine in London which is a demonstration machine, so you know, an hour would be to X Y Z company to come in to run their machine and get that ready, so that when the machine went in to their works there’s a good chance. And of course they’ve usually got a very tight changeover schedule, so it all had to be planned, yeah.

_Hmmm. I’m trying to think, is it mainly the salespeople who are doing that then or –_
Oh absolutely, I did – never saw – see any about that, no no no. No no no no no.


[34:53]

Any other finals thoughts on this period in your career?

I think the main point is I think it was the most interesting, useful in the overall thing, and ability to control my own destiny and decide what – what was going to done, and not only my destiny, the company’s destiny in a curious way. But then the world moved on beyond me, you’ll see in the next phase what happens to me then, yeah.

[End of Track 9]
Track 10

Let’s start then again –

*Okay, shall we just do a quick check? Ready to go.*

The – can I continue?

*Yeah, go for it.*

In the very early days of computers in the UK those that were being – being developed were being developed by universities for solving mathematical problems, business didn’t enter into it one iota. The – there was Cambridge, there was Manchester, there was Booth in Birkbeck in London, there was NPL with the – starting their … ACE developments and … fairly regularly Wilkes hosted in his mathematical laboratory in Cambridge a symposium of people interested in the computer business, and you could get all the British computer industry in – in one lecture room. About thirty or forty people used to turn up and in one of these Cooke-Yarborough was in the audience and the discussion was generally on memory and how remarkable it was, and Cooke-Yarborough stood up and said, ‘Memory is very selective,’ he said, ‘my father was an auctioneer and they sold cattle … in – in market and the chief clerk had a fantastic memory, he could remember absolutely every cow or – or cattle that was sold, its weight, who it was sold to, how much for and when, then my father used – started to deal in sheep, but his brain wouldn’t work in sheep,’ and he sat down [both laugh] … hey-ho. Right, now what do you want to do now?

[01:49]

*Could we talk a little bit more about these meetings as they popped up?*

Yeah, surely …

*What was the atmosphere like?*
Oh very – extremely friendly and relaxed, yes, except for the usual academic knives out which happens at – and still does at any academic activity because academics live by their reputation and their image. So – not by their salary [both laugh]. So let’s think what to be said. The maths labs in – in Cambridge was an old-fashioned building, the ACE pilot model was on – I didn’t mean the ACE pilot, that would make Wilkes turn in his grave except he’s not dead yet. The EDSAC was on one of the floors, which to an engineer like myself was horrendous, it was a cats cradle of wires … it – entirely, as an engineer, impossible to reproduce it, but that’s – was not its point, that was not its point, its point was to build something that could be demonstrated to be a very fast and efficient computer which was – it – it was and they did, but the interesting thing was that I worked for British Tabulating Machine Company which made tabulators and tabulators consist of masses of relays and miles of wire connecting them all together. And the wire was all cable formed into big thick trunks of – of wires, different colours, all laced together, the whole cable form would be produced in a mass and then a machine would be built and then the cable form would be put against it and all the wires would come out at the right point and just be plugged on. However, that would be quite unsuitable form of construction for a computer with high frequency pulses going down the lines, ‘cause the capacitors of – capacitances of these lines would be very high and the cross talk between the lines would be very high, so signals would be picked up everywhere. Wilkes and his crew very sensibly kept their high frequency lines in midair as much as possible. Now you – you might say, ah, but that would be a big aerial and pick up interference from elsewhere, yes it would so [laughs] you can’t have it both ways. So anyway that – there was these racks of valves and – and things for – EDSAC was a wonderful – the meeting room was in the same building, just a typical university room, though interestingly on the windowsill of the – of the room was a bit of [sighs] … Lady Lovelace was his programmer, the man that produced the first computer?

**Babbage.**

Babbage’s, thank you, god what a brain it is. So this was a bit of Babbage’s original machine, was it? No it wasn’t, it was a – a rehash of it or a – a – I think – I don’t think it was a piece of the original, but anyway as you can imagine a lot of wheels and things, but if you looked at the Babbage machine in the … British Museum, South
Kensington where I think it is, it would immediately ring a bell. So that was interesting yes. Not much else to say I can think of.

Who were the other people there, do you remember anyone?

Well people – it depended on what – when it was, you know, who – who turned up that time. But Manchester – well the people I was saying, NPL and … Booth occasionally came but his relationships with Wilkes wasn’t – weren’t that good so he didn’t often come. No, so that was us and I came from industry and some other people came from industry. Joe Lyons would undoubtedly have started their concept of possibly making a computer using the EDSAC as its basis, which they did and very satisfactorily too and it was the first commercial computer really, only one of them mind you of course, and had mercury delay lines, can you see mercury delay lines all over the world, no you can’t, so – but a very interesting machine. Who else was there? I think Plessey were trying to build a machine, certain … industrial complexes like Metro Vic, GEC, thought they had to be in the computer business, so they were the sort of people that would be there, yes. Oh and of course there were – some of the government laboratories like TRE would have been represented, yeah.

Hmmm.

[Closed between 07:08 - 09:28]

[09:28]

You mentioned academic knives being out [laughs] at these meetings, I was just wondering what were the opposing viewpoints?

Oh, goodness only knows. I can’t remember, I’m afraid my brain wouldn’t – but academic knives are very subtle usually, that – that you may not realise that a knife has been stuck in, if you understand [both laugh].

And did you notice any difference of outlook between the academics and the engineers?
Oh of course, of course. Of course … I mean and also of course the academics were very scornful of the engineers and of course the – the academics of Cambridge were particularly scornful because they were Cambridge, they weren’t Oxford of course but nearly.

[Laughs].

So let’s think what to say on that front. An engineer like myself had a different attitude, the university people wanted to demonstrate an effect, show some – something – solve a problem both mathematically or physically and then forget it or move on, you know, there’s a PhD in it, it would be there that concept. Whereas the my – my attitude as an engineer would be, will it work, how much will it cost, is it reliable, could we make it by – by the hundred; quite a different attitude of life. Hence this argument which you may remember as to which faculty my PhD went in, that was – that was the nub of it, that was the nub of it, is it engineering in engineering, or is it science. And the answer it’s engineering and it really is engineering. So – so that was that. And … as far as the engineering side went, Wilkes strange – sorry, delete Wilkes, Booth … was a very practical man as an engineer in his way, he was an engineer marker [ph] but he was also a – a great thinker and a great designer and extraordinary man. I would think possibly the greatest mind I’ve ever – had anything to do with. Yeah, let’s think a bit more to say on that. Booth’s basic circuits which were used in the HEC1 machine, which I then copied for BTM and then productionised it and made it so it could be put with drawings and instructions to a group of un – semiskilled people that could make the various pieces, test them, join them together, assemble them by the hundred and they would be maintainable at a reasonable cost and reproducible. So such a design is far more complex … sorry the – so many more factors to be considered in it than a university machine which has just got to be demonstrated, look it’s got the biggest crime, right, we’ll move onto something else, crime I should have said prime [laughs]. Freudian slip. The – no, out of interest that was one of the things that used to happen at these meetings, a chap called Hartree, a very famous pre-Wilkes – probably Wilkes’ boss, professor, mathematician, would come in and people would say – I’ve forgotten his – his name, let’s call him John, ‘John got a bigger prime than last time,’ ‘Oh yes I’ve got to a twenty-nine digit prime or whatever it was,’ so the – the machine
was used amongst other things to – to look for the largest prime. Which isn’t as easy as you might think, there are – I’m sure you know, there are great – lots of mathematical support to where you look for primes and what are and they go in pairs and all sorts of things. Anyway, where have we got to in this ramble?

[Laughs].

You were talking about …

We were talking about the Cambridge – actually we’re [both talking at once] talking about Booth at the moment –

Cambridge machine, right –

I was wondering why you described him as being a genius?

[Pause]. Firstly because he was extremely economical in latching onto a facility or something he had designed or developed, pairing away all the – all the extraneous things and just concentrating on getting the thing that he wanted to – to do down to the smallest area – sort of assembly that he – he could get it. That doesn’t make him a genius, I entirely agree … he went over to America with his later wife Britten to look round the computer field in America, I would think it would be [background noise].

Can I shut the door?

[Break in recording]. ’47.

Oh hang on, let me just pop that back on.

The trip to America would – by Booth and his wife would be I think about 1947 … at a time when the American computers were in the formative stage, not many of them were working and so he – he analysed all the parts that you needed in a computer, the basic building bricks that there’s a store above all else, the input and output, how you would do the mathematical functions, add, subtract, multiply, divide, he looked at the
various possibilities for these things and from all these things deduced what the best mix would be, which he then – for the type of machine he was able to – he wanted to build which was smaller and – and cheap for him, so he had a great analytical brain. What else – else about him? Then, he was an engineer to his fingertips, building things and making them to work, again extremely simply … what else to be said? Because he had such a quick brain, he didn’t suffer fools gladly, you had to – by god you had to keep up with him when you were talking with – with him, if you know what I mean? I got on well with him but many of the people in … British Tabulating Machine Company who hadn’t had an academic education, not – well I’d only got one degree but – no, two by then, but anyway what I’m trying to say is that they hadn’t – didn’t interface well with him, so they just regarded him as a slightly mad genius that we will pay some money to and – and use what he’s spin – what the spin-off is, which was also BTMs attitude towards me for – to start with. All this money was being poured at this chap with corduroy trousers and what have you and … but they had no other choice because they wanted the output. So going back to Booth, because his brain worked on a higher level than other people’s, he had difficulty coming down to their level if I – but that still doesn’t answer the question why I thought he was a genius. It has been said that geniuses have the power of taking infinite pains, he was entirely switched on all the time and … his rate of deduction and – and solution of problems was terrific, yeah, so I – I haven’t really answered that very well. What would – properties would you expect to find in a genius?

I don’t know, that’s why I’m asking [both laugh]. No, it is something that’s difficult to – to qualify.

It is indeed, very difficult to qualify, very difficult to qualify. It wasn’t that he was just clever, no, there was – there was more to it than that, more to it than that. Yeah. Intensely curious, mind worked all the time on … what could we do with this, where can we go, what extension can be made to it, forward looking all the time, yeah. But he – he was not an organisation man, he could only work with very small teams that worked for him, and very luckily … since he was competent that what I was doing was what was necessary, he’d just let me get on with it, which – which was a compliment I suppose in a way, yeah, so I did. And then of course he very quickly bowed out of it ‘cause the world just rolled on, once the industry gets rolling, I mean
there were hundreds of people doing all sorts of things, bringing the bits together. Of which British Tabulating Machine Company of course had all that there devoted to doing punch card machines, but the – the functions, development, research, production, introduction, planning, servicing, publication, publicity, marketing, all those factors were there so that putting a new product in, though it was strange was not so difficult. Because also of course they had a vast training school, so a trainee – trainee manager would come to see me and say, ‘Now look, we’ve got to train these field engineers, how do we do that?’ you know, and so we talked that through and then it was decided in – in that case that there were these people called hams, you know what a ham is, they’re still around. They’re amateur radio chaps that have radio transmitters and receivers and send messages to each other all over the world. In those days the hams built their own equipment, resistors, capacitors, transmitters, what have you, many of them were ex-servicemen, particularly RAF chaps who knew about valves and that sort of thing. And they were very interested in the mechanics of what was happening, so quite a few of the initial servicemen were hams and development men were – were hams recruited because they had this knowledge.

Yeah.

Hmmm ...

But the ham world changed because people used to then buy the kit already built and all they got was a Morse transmitter and so forth, and then Morse went out, now it was speech, so the whole world became like it is now, you buy a television set, you now buy a ham set.

Hmmm.

[21:33]

In the early days of computers at the British Tabulating Machine Company, one two three four, myself, Billy Woodshill, Dickie Cox and another chap whose name I can’t remember were all ex-RAF engineers in a way.

Hmmm. Can you tell me a bit more about those people you just mentioned?
Surely. When I got to British Tabulating Machine Company there was already an electronics section, working for a chap called Billy Woodshill who had been a flying officer in the RAF, signal – signals sort of officer, engineering officer like me, however his background was quite different from mine. He’d been what was called a BRAT and that was the RAF set up a – an extremely efficient and ruthless education system for engineers of all sorts, based at Halton where the BRATs school was, the lads joined at fourteen, signed on, had all the rough edges polished off them, learnt how to survive in a jungle and, yeah, and their education was excellent, so Billy Woodshill as an ex-Ham – sorry an ex-BRAT. What to be said about him? He … was … an inventor in that he – he liked to devise new things and so forth and make them work … but because he hadn’t been to university and knew the fundamental physics behind what was going on, unlike in the RAF where the service – the – the education there was to – to make something work or repair it that existed and had drawings and what have you, so new things were not developed in the RAF, or at least by those people. So Billy Woodshill’s inventions were often not practical. For instance he developed a very small super regenerative receiver, super regeneration, there we are, if you take a – an oscillator, a radio frequency oscillator at the frequency of the station you want to receive, home service, something like that say, and then you turn up the … amplification, an oscillator depends on feeding some output back to the input so that it can oscillate and grow. It – an amplifier is exactly the same without that turned up so much, so the area would be joined to this amplifier and that will amplify the signal which you will then rectify and hear through some earphones. If you turn the – the … feedback up and up and up till just before it oscillates, the extra … signal coming in from the aerial will be magnified very greatly, so whereas you might have had a normal amplifier that would amplify 100 times, just at the point of feedback it would amplify 1,000, 10,000 times. Mind you another little tweak and the whole thing’s oscillating and whistling like fury and quite out of control and that was the problem. You had this little receiver which if tuned just right, and it wasn’t too hot and not too cold and the wind wasn’t in the west, it would produce a very terrific amplification and small, cheap but not – impractical is the answer. So that was an example of the things he did. But anyway, why was – why was he there? Billy Woodshill and his team had been developing very successful indeed firstly an electronic multiplier, I think we may have talked about this before, punch card
machines had no multiplication built into them, they were very difficult to make a relay multiplier, it was slow and unreliable, but almost every business calculation needs some multiplication somewhere, hours worked at so much an hour, buns at how much up there and how many buns, all the time you were multiplying. So punch cards had this great weakness that they couldn’t multiply, or satisfactorily multiply, also there was the – the matter of pounds, shillings and pence, and tonnes, tonnes of weights, quarters, pounds and all these odd radii, whereas on the whole most counters worked in tens. So Billy Woodshill designed and built, possibly with some input from IBM, who had a – a multiplier, I don’t know that point, but anyway these machines were called the BEX, B-E-X and BEM, British Electronic Multipliers, BEX I’ve forgotten what that – probably British Exhibitioning Machine my guess is ‘cause it went to an exhibition, and anyway so he developed a multiplier and from that he then developed a calculator. Now I always think that calculators get the raw end of the stick ‘cause they really are computers, but the computing crowd poo-poo’d them and said, ‘Well it’s just a bloody calculator,’ the fact that it didn’t have a stored programme on magnetic tape or electronically, but the store programme was in a plug board somehow ruled them out. But the – the great point about a computer is it has this choice function in it, test function whereby you can decide where – what is done next in the calculation by what has happened, is it less or more than zero and so forth. And with a whole lot of these test functions in any plug board programme or computer programme you’ve got a digital computer. So anyway, he designed with his team, about four or five chaps, very good chaps, these machines, they used octal valves which are the big valves, they had plug-in chassis for counting up to ten and so forth. And they were marketed and they were an addition to the punch card range, so in the punch card room with the tabulators calculating – multipliers – sorry, just exactly one of them [ph], the tabulators, punchers, verifiers, all around the hand punches, there would be – in the corner somewhere a calculator which would do all these fancy jobs that big punch card people – organisations needed. So that was Billy Woodshill. I got on extremely well with – with him and his chaps and they were very helpful to me and we – we – you know, we socialised as well as – there was a fair bit of drinking, it must be said. And also with Billy Woodshill a fair bit of womanising to be – it must be said, so that was that. What else to be said? Dickie Cox was a radio ham and he came over from Billy Woodshill to work for me, and where you were talking about lab assistants, I suppose Dickie Cox was an electronic lab assistant, very
… clever with his hands, making things. For instance when we had to take Doc Booth’s magnetic drum and make it work, not – without being rude to Booth but it did have to be engineered, he did that very well indeed. Deciding the thickness of the magnetic ion oxide that was coated on the drum and how to get it right was one of the things he – he thought, he did it in a – in a – a practical way regrettably, not a scientific way, he did it by spraying the stuff on the drum and wiping his thumb across it and it worked [laughs] and it worked. But anyway, there we are. So that was Dickie Cox, a nice chap, got – I used to go on holiday with him too, motorcar and sidecar round Scotland. Very brave man [laughs]. One of the other chaps, Lorin Knight was also an ex-ham who worked in Billy Woodhill’s team, he … used to be a ham operator and used to take various bits of development and market them, and one of the things he marketed which was very successful was a – a little screened box where you – you had an aluminium box with a double ridge round the – the lip – the – the rim of the lid with four screws and once something was in that box it couldn’t radiate or – or – or have any interference picked up, well very – so it was a screened box and he – he sold these and sometimes with little circuits in for doing things, so he was a good chap. I can’t think of any of the others – chaps that were – had any particular attribute that would be of interest, hmmm.

*These screened boxes, this was a little sideline as well as the BTM?*

Oh yes, quite – nothing to do with British Tabulating Machine time at all, this was a – a thing that he – he did to earn a little bit of money on his own.

*Hmmmm.*

And also I think he – he used to sell a little circuit for doing something, I’m trying to think what it would be. It’ll probably come back to me what – what these little boxes did, but anyway, good chap.

[32:13]

Also it should be said that Lyle Street should be mentioned. Lyle Street, though I think at the moment a home for street walking whores is it – was in fact at that time a
mass of electronic … second-hand shops where all sorts of equipment which had reached the end of its life or had never sold was being sold. Not only resistors, capacitors, all the … components, but also actual boxes that did things, which we often bought because we can modify them and use them in some way as test equipment or what have we … and one of Booth’s also bits of genius was that because he was poor – because there wasn’t much money at Birkbeck for doing this, Lyle Street was one of his sources of things and he then realised that the – the B7G valve base range of valves, which had been made by the million and were being made by the million, would not only be reliable, because they’d been made in such vast volumes, but also would – would be cheap because they would be on the second-hand market, so you could then buy – probably still can, well I don’t think so, probably can think about that, boxes of valves at – with ten by ten slots in so they’re – tell the – 100 valves in a slot, all in a – in a egg box type construction. And the – the basic valves that … Booth used all over his machine were a standard double triode and a standard double diode and all the shifting registered and the flip flops, Eccles Jordans, were – were made with these. And yes, Lyle Street was a great port of call.

*Where is it?*

Lyle Street’s in London. Just behind Piccadilly Circus, North West of Piccadilly Circus. I’m sure Lyle Street is almost certainly still there, but I don’t think it’s got these sort of scrap places there.

*Could you just describe it for me so I’ve got a mental picture in my mind?*

What Lyle Street?

*Hmmmm.*

A narrow street … with rows of single shops, all different, not reproduced in any way, not a – a range of shops, just houses I suppose that had been converted into shops. Which were absolutely stuffed full to the ceiling with equipment and you had to sort of slide your way between rows and rows of equipment that went back to sheds at the back. And there’d be a couple of chaps who owned these shops, or I presume they
owned them and you’d say, ‘I want a so and so,’ so he’d know what – where everything was and you would fight your way through a – a mass of – of junk, that’s the only word for it, and something would be produced out of there and then – then the arguing and the negotiation would go on, you know, ‘Does it work?’ ‘Whoa, how do I know,’ you know, ‘but you’re a clever chap,’ and, you know, that –

[Laughs] What were the staff like, were they electronics experts as well or –

The what, the –

The staff in the shops?

No, they were like all peddlers, they knew … the superficials of what they were flogging … or if they didn’t they’d say, ‘Goodness only knows jub, I just got this lot from X Y Z,’ ‘Well where’s X Y Z?’ ‘Oh you mean the – the army disposal unit?’ ‘Yeah, that’s right,’ so that immediately gave a clue to anybody looking through that – the sort of things you were likely to find there. No, Lyle Street was terrific.

Okay. That shall be fine and back running.

Shall we go to lunch in a minute?

Shall we just finish talking about Lyle Street and –

Of course, of course, let’s think what else to be said about Lyle Street … there was a magazine called Wireless World, there was only one such magazine, now there are, you know, rows and rows and rows of magazines, I think there was another one called Amateur Wireless but nevertheless, and in the back of that there would be adverts for part of this junk which was a source of call … the equivalent of Lyle Street I think still exists but it would be on the internet or … somewhere.

Hmmm.
I know it does because my – my son-in-law, as you know, is into the antique … military vehicle business and all the time he’s – in fact upstairs there’s – there’s a – there’s a filter for filtering oil which he’s delighted to have found through the internet at five pounds or something because it’s from a 1940 Morris 1500 weight van which he – which he’s got, so – so it does exist, in fact I think it’s much more flourishing and much wider distributed than it was, ‘cause at that time it was based on physical shops, now it’s based on the net so the – the clientele is vast and the power of sorting through what – where it is and to get it is – is greater, hmmm.

[38:18]

So you read Wireless World as well at the time?

Oh yes. There was – at that time there was no computer magazine of any sort … trying to think what magazines, articles on computers came in … the – most of us were – what it’s called, not fellows, that’s too high, associates of the Institute of Electrical Engineers which never really got to terms with the computer business – business, don’t ask me why but they – they failed … and there was another society started up to deal solely with computers, but this is – is later in the dates and what we’re talking about.

Hmmm …

Can’t think of much more to say on that.

I’m just wondering, what do you get out of reading Wireless World, was my question.

… Wireless World would typically – or Practical Wireless which was the other one, be dealing with the circuitry and how to build say a ham receiver, ham radio receiver, would be a typical example of what – what would be there …

Hmmm …

At the moment I can’t – I’ve got a few copies upstairs, I could have a look but –
[Laughs] I was just wondering if you read it, you know, for technical knowledge or out of interest or –

Oh yes yes yes, all those things, yes very much so, because of course since there weren’t any computer magazines as such … that the valves and all the circuitry that went round valves, power supplies in particular were all common to other uses of electronics …

[40:28]

And of course what I didn’t mention is ex-military surplus was the thing that Lyle Street was full of, I didn’t actually say military but it of course was, radar sets, radio sets, masses of them, yeah. Out of aircraft, ground based, military – marine ones, all the sorts of things, yes. Backpacks for soldiers with radio sets, everything of that sort, yeah.

*It’s curious that you sort of get military grade electronics [laughs] being sold, you know, just –*

Oh yes, no – no – there was no ban on it in any way whatsoever, in fact great huge sales were of course held at the great big service depots clearing all the sheds full of stuff which had to go, because of course the armed forces shrunk, the … rate of development of new products was huge so that old equipment had to be dumped, yes. A lot of – well you think, hundreds of thousands, well tens of thousands of aircraft full of all this equipment, and the ground stuff to support it.

[41:51]

*One final question on this … obviously, you know, electronics is your day job, do you also dabble at home as a hobby as well?*

Some of the people – some of the lads did, because they were hams as I was explaining. And the hams not only communicated with people in Australia or
wherever it was the ham went, but there were local groups of hams, there was a social circle with the hams where they used to hold camps that typically – now there’d probably be an Easter camp up on top of the Downs somewhere where they’d set up all their trans – mobile transmitters. That was the point, it was mobile, mobile hams were different obviously from the static hams, they’d go up and set their little aerials up and communicate with some other group of hams on another hill somewhere, or in another country more like. So you were going to say … was there a social side, was there a – a technical side to when I or other people went home?

Yes.

The answer’s no. Not at my case, I had a – a lot of technical things on – trying to get old motorcars to work so I had something to travel in, that sort of thing, repairing the house, there was a lot of physical mechanical things being done but they weren’t electronics. Except yes, I would – in my case I was – I modified a ex-airborne … receiver called the 1155 which was a typical one, hundreds of thousands have been made and put in bombers so you could use those and – if you modified them and used them as a – as a set in the house.

Sorry, a radio or –

Yes, radio, yes. And then there were other lovely American radio receivers which you could get second-hand, lovely lovely machines, beautifully designed. No, mostly I don’t remember ever developing anything at home or any of the lads developing anything at home that was a component of the computer itself. Like a magnetic tape store or core store or anything, no, strangely enough. I think we’d just had quite enough of it at – at work. But did I forget it when I went home, no I didn’t. I lived that – those machines in my brain all the time and I’d wake up at night and seize a bit of paper and pencil and write something down and go to sleep again, you know, oh no no, you – it was exciting and … in particular in the early days of computers, my mind was very much occupied, how to make a simple low cost multiplier and divider and – and I think I meant a conversion, which is from the punch card in pounds shillings and pence into binary and then out again back again. That problem was with me for many months, thinking about and doing things. And then I think I showed you some
books called Ideas, I don’t know, did I show you some red – red covered book called Ideas One, Ideas Two, I didn’t show you that one? Anyway, doesn’t matter.

_Hang on one sec._

[Walking away to get notebooks] Oh of course … So these are all ideas for adapting or developing various bits of circuitry that I needed to do various things, often to try and do it cheaper or with less components. That in particular would be a logical work out as to how to very much make one device … able to do several functions, so you save money. Very much so.

_When do you write in these notebooks?_

At the time, oh very much at the time … multiply, eighteenth of the second 1952 I wrote that you see [pause – reading]. [Laughs] Let’s see, pulse had made to pulse C6 ble-ble-ble-ble, but if the four valves ble-ble-ble which it replaces are removed the respective orders will not set up, why oh why? Cured by removing coupling network [makes mumbling sound] and so on, so these were the problems, but also new devices that got incorporated into the machine, well a proportion of them. There we are.

_What’s – what’s the value of writing stuff out like this?_

It’s immediate and … to the point. It doesn’t have to be typed or manipulated in any way … so that – this – these two were really a day to day log of the problems and solutions to taking Booth’s machine and expanding it and modifying it and making it – well functional and then later than that … manufacturable. This book, Ideas was … functional logic and circuit invention for HEC and BTM machines. So that described it, what it is; so new circuit, getting constants into registers, double speed of computer, multiplier, simple high speed computer. So all sorts of things; double action computer, how to eliminate some valves, trio coupled counters and so forth. So all the time … evolving and thinking and doing things. In no way under control, by that I mean no meetings, no bosses, no distractions of any sort, I was doing what I was released to do and thank god my bosses had no idea what I was doing and just had to trust me to do it, and I think that was true of many people in the – in the
computer industry, because … people, men, have that – the sort of inventive brain up
to about thirty usually and then it goes, that’s my experience, and then they become
managers or that sort of thing and then that’s a – people don’t – who are in business
don’t – in engineering don’t recognise this is happening to them, they don’t realise
they’re over the hill effectively or they’ve changed into a different sort of person,
they’re no longer an inventor, they’re no longer deeply involved to the day to day
minutiae of what’s happening, they’re telling other people what to do and – anyway,
there we are. Shall we go and have some food?

Excellent.

[End of Track 10]
About that exhibition, right. Okay, every year all the manufacturers of business efficiency equipment, typewriters, calculators and so forth had a big exhibition in which the punch card machinery manufacturers were the – the top of the tree because they were the most expensive, that’s Power Samas and British Tabulating Machine Company. The – the first year we exhibited a computer which was the HEC1 machine, that was the straight copy with input and output of what Dr Booth had invented at Fenny Compton, we were exhibiting this and what the hell did we put on it to demonstrate ‘cause it hadn’t got the input and output that would really be sufficient to do a decent business application. So we demonstrated noughts and crosses for which I built a special input and output, and bidding a bridge hand of acol, which all went down very well. The publicity manager obviously wanted to show off this machine as well as he could and I’d told him that multiplications take milliseconds and so therefore, you know, very quick and he found a calculating genius that was wandering around that could multiply huge numbers together very quickly. So he brought him along to try and arrange a demonstration, so we got a punch card girly who would punch cards with the numbers which we would then pop into the computer at the same time as he – he had the numbers, so the numbers were two eight digit numbers, decimal digit numbers which were read out and of course the girl punched these numbers at the same time as the man was doing it and the man was registering it in his brain at the same time and then the girl took the punches out of the thing and thread it into the computer, while the man said the number is ble-ble-ble-ble-ble, so in other words he calculated it before we could get the numbers actually into the computer [laughs], so the speed at which the computer did it was quite immaterial, which just shows you you’ve really got [laughs] – got to use your brain when you do such things. Still there we were, stop.

[Laughs] Right.

‘Cause you see from my point of view, all this information is effectively going into a black hole, just the same as the information from –

That’s running now, okay?
Right?

*That’s running, just so you know* [laughs].

Doesn’t matter, it’s going into a black hole, just the same way as the information I gave to the British Computer Restoration Society has gone into a black hole, is giving no feedback and no sign that there is any indexing or link-up with the two sources. Right, okay, on we go.

*Okay.*

[02:57]

We were talking about sort of the early computer days at BTM, you mentioned earlier just a little flavour of what the sort of social life was like at BTM, I was…

Not much more to say … social life at BTM, we were at the manufacturing and development unit which was at Letchworth, I lived very near so most of my social life was at home. But nevertheless one did go out and have – have beer evenings in – in the pub and so forth. And of course there was no drink-driving in those days, so yes … and it – you know, we were pretty boozy. Yeah, nothing much else to say, yeah, yeah.

*Hmmm, I was just wondering, were you were talking about sort of work related things or otherwise?*

I don’t think much different from a – a group of lads that get into a pub today, I don’t think there was any 1950s factor.

*Hmmm.*

Beer was incredibly cheap, wages were incredibly low so …
[Laughs].

[04:03]

You were talking earlier as well about the symposia down at Cambridge, I was just wondering, what did you learn from going along to those, what did you get out of them?

… Very little additional information that would help what I was doing computer – but I think there was a sense of … you were not alone in the world, there was other groups of people also developing these things, and of course because it was a commercial world there was a feeling of competition, so yes it helped, excellent, yeah.

Hmmm. Do you … it’s interesting you said you weren’t alone in the world, did – did you feel that way otherwise, apart from these meetings?

[Laughs] Vaguely yes because here you – I had in this very large firm of British Tabulating Machine Company with what, 50,000 employers or something, customers all over the world and huge factories turning out these machines, except for Billy Woodshill who’ve I’ve mentioned and myself, nobody else knew anything about electronics and were of course – they were frightened. They were either sceptical or frightened or both at the same time. But … I – yeah was young and bouncy so I didn’t ever feel any serious – ‘cause there was never any threat to the job or anything like that, far from it, far from it, no.

Hmmm.

[05:45]

Who was your manager at this time?

Oh yes, I think I’ve talked about a bloke called Womersley, Dr Womersley yeah, Dr Womersley was my manager. But he faded out after a while … he just wasn’t a big company man, he wasn’t – no, he would do much better running a small research
institution, which in fact he was at National Physical Laboratory. He was responsible for getting the ACE machine underway, ACE pilot model; all power to him. But Turing you were mentioning a bit earlier was one of his staff.

_Hmmm._

[06:30]

_I was wondering as well, BTM had had an earlier link-up with IBM hadn’t – for –_

Yes, BTM signed an – an exchange agreement with IBM, probably twenty years earlier and manufacture – and manufacturing rights, so they manufactured direct copies of many IBM machines originally, but then because of Stirling and all sorts of other reasons the two ranges of equipment drifted apart and straight competitions was growing up – delete that. Straight competition in the UK was not a problem because they – IBM were not allowed to manufacture or sell in the UK, that was part of the agreement … about 1947 I suppose it would be, BTM decided to go it alone, you would have to read the history books to decide why that was, I don’t know, but people still around in Letchworth remember IBM top brass, Tom Watson, visiting with the flight [whistles] – stars and stripes flying over the works when he visited. I don’t think relationships with – with IBM were bad, I think that the companies still occasionally talk together socially and that sort of thing. But then IBM decided to move into the UK and then the gloves were really off and IBM – its properties are well-known and I won’t go into that, but all had pinstripe suits, you know, turn a handle and out comes another IBM man. Extremely efficient, I’ve got no grumble about, but extremely ruthless, extremely ruthless.

_Hmm, what was the opinion of IBM within BTM at this time?_

Fear … huge company, roll us underground, yeah, and it was only Stirling that kept us alive for a long time because they couldn’t deal with it.

_Was it that much of a worry then? Were IBM that much of a worry that early on?_
Well it didn’t worry me where I was and my job, but certainly I think if you look at
the – the history books you will find out what they thought about them at head office.

_Hmmm._

Because I mean like any huge company it could undercut a small competitor
anywhere in the world if it – if it subsidised that against the other parts of the world.
And there was also this phrase, nobody ever got sacked through ordering IBM, so …
there – yeah, but there was considerable … British pride in many – many of our
customers and who were loyal to us because of that.

_Hmmm._

[09:48]

**What sort of reception did your computers get from the customers?**

Mostly excellent, mostly excellent, yes … you may remember when I was telling you
about the seven HEC2Ms were made which – M for marketable, but you could say M
for mathematical as well really because that’s what they were aimed at, people that
didn’t want to do business calculations. They all worked satisfactorily, though one
did a lot of – gave a lot of trouble, that was at ESSO Fawley, I may have mentioned
this, anyway I’ll tell you again. ESSO Fawley, vast chimneys, flares, tanks, bits of
apparatus, hydro formers, catalytic crackers, on the edge of Southampton Water. The
installation there, air conditioned room, beautiful, no trouble, but the machine gave
continuous trouble when it was reading in data, we never could get to the bottom of
this for a long – long time and it was quite serious, and I as an electronic engineer
went over the whole thing and I couldn’t understand why it didn’t refuse to read in
data occasionally. And then an – an old-fashioned standard clever knowledgeable
punch card serviceman came along and we told him what was happening and he said,
‘Well which relay is it?’ you see and so forth and I said, ‘It’s that one,’ and I said,
‘look it works,’ ting ting ting and he said, ‘Ah yeah,’ and then he took out the – the
armature, the flap that is attracted down by the magnet and opens the contacts, and
there low and behold on the little plate that it touched there was a – a grease spot,
waxy grease spot and he said, ‘When the machine gets cold and that cools down, those two things stick together by the grease, so that when you first route information to that relay it opens slowly, it opens but it opens slowly and so the information doesn’t go into the computer correctly,’ so every – every time after that that relay worked correctly. So a swine of a fault but again you see the – the man that really knew was the service man ‘cause he’d seen it all before, so that was that, but anyway the machine worked well at Fawley when we got over that. There was a nice little pub in Fawley village where the – the publican was a – an alcoholic who just loved everybody and we – we had – ‘cause we had to work all night, yes we had to work all night because they only let us on the machine when they didn’t want it in the day, so there was this great fairly silent except for hissing, but vividly lit installation, so a park of apparatus, the works, the – the refinery and you’d – you’d moat along there at night, a weird sight, very weird, and all these flares going off around you. Anyway, and then you’d get back to the pub about four in the morning and he’d left the pub open, the bar was open, if you wanted a drink you just went and got it and so forth. Very trusting man but – nice chap, got on well. The pub went broke [both laugh]. Anyway, there we are.

[13:39]

*There’s one other thing that came up earlier I was quite interested in, you were talking about your other colleagues and them having a certain practical mindset because they’d been sort of RAF people who’d fixed things.*

Yes yes.

*And they hadn’t had a university background.*

Yes.

*I was just wondering how – how did your outlook differ for having been to university do you think?*
[Pause] I think particularly because I’d been to Imperial College and I’d taken an MSc there, which was where I was again completely responsible for what I was doing, designing the apparatus, setting up the apparatus, doing my experiments, I had a – a tutor, Dr John Lamb but he left me strictly alone and I just got on with it, so I think this business of being in a mechanical area of new stuff where you designed your own thing and did it was different from what these other chaps had experienced where they were in a – an already defined society with this apparatus, this organisation and so forth. So I was more used to ploughing a lone furrow, a new furrow than they were.

_I think_ –

Attitude of mind, you know, in – call it invention, but it’s not quite invention, it is partly invention, but it’s partly … you can say invention of – of an organisation and an environment, evolving how to invent a new thing and dealing with it and so forth. Nothing very clever if you’ve just got the right mindset. You know, ‘I want to do this so how do we do this, who’s going to help me, how am I going to get permission, what apparatus do I need,’ and so forth, yeah.

[15:53]

_I was wondering as well how important is it to understand the physics that’s behind the electronics?_

[Laughs] … Only in special areas is that necessary. The physics of recording on magnetic surfaces is important because of the history of the magnetic material you’re recording on, the fact that if you have a thick area of magnetic surface and re – took record a one on a spot on the – the surface, that magnetises an area of the thing which then has very low – I’m trying – I can’t think of the technical term … impedance to – to an electric field ‘cause it’s already – magnetic field ‘cause it’s already been magnified, magnetised. So the second pulse that comes along finds that there’s already a magnetic pit dug so it can make the pit bigger, you see, so that the – the bit spreads. So if you do this two or three times, and you then try to overwrite that area with a – a zero where the magnetisation is in the other direction it – one zero pulse cannot wipe out all the previous magnetisation put in that spot on the drum by the
ones that preceded it. So a concept of the magnetic hysteresis loop, what’s going on, working out what I’ve just told you, which wasn’t obvious and wasn’t published, but if you knew the physics then you could do it. So that’s only thing about the physics things. Another time, a part of an apparatus that never got used in the end was a store made on what were called difference diodes. If you’d take a diode with – diode – two electrodes in a gas, sealed in a gas, if that gas is something like neon, then at a certain voltage it would strike and then a discharge would build up between those two things and at that point you could lower the voltage because it took perhaps fifty volts to strike, twenty volts to burn. Don’t relate that to – to neon, I’ve no idea. Anyway a firm came along and said, ‘Look we’ve got this difference diode where it’s a – a fair difference between the striking temperature – striking voltage and the burning voltage, any use?’ and I said, ‘Yes, we can make a store about this,’ because the other thing is that if a neon is struck, then you can send a signal through that neon, half a volt through [inaud] like that, so it is like a resistance. So sounds jolly good, we built a matrix of this which – storing numbers of digits and ways of getting at these things. And it – it kept on failing, odd digits kept on coming in, very seldom but now and again a – you know, we researched it, couldn’t find the hell what it was about. But then, having had some physical knowledge, went to talk to a chap at Imperial on a – a bloke, and he said, ‘Ah no problem,’ I said, ‘What do you mean no problem?’ he says, ‘Cosmic rays,’ he said, ‘every now and again a cosmic ray will strike one of those things and – and strike it, dop, and it’ll light and that’s purely random and there’s nothing you can do about it,’ so the whole thing had to be scrubbed, forgotten, pushed in the dustbin, but it – again without some knowledge of physics I don’t think I would have found that problem. So anyway –

*And it’s your job within the project then to have that knowledge of physics rather than the purely electronic side of it or –*

Well you’re crisping that up.

*Ah, I’m just sort of trying to draw it together, it’s –*

All I – you asked me was it useful to have a knowledge of physics, the answer is yes, very.
[Laughs] No it was just you –

Did it give me an advantage, yes it did.

I was just interested before that you mentioned this morning that you would expect the lab technicians to understand the physics so much?

No I wouldn’t no.

I’m just sort of thinking, well are you the – are you the person understanding the physics in this laboratory context then?

Yes I was in that. But you – you would say well what would a – a company do that hadn’t got people like this, they would undoubtedly have a consultant that would wander around and help on these things, in fact if I hadn’t been there Doc Booth would – would undoubtedly I suspect found out what the problem was or made suggestions.

Hmm.

[20:38]

I was trying to think if there was any other area where knowledge of physics would come in. I knew a lot about valves because I’d worked for the Marconi Valve Company so the – the problems in valves I understood in – and there were lots of problems in valves, every valve has a getter in it which is an area of ionised aluminium that is burnt off inside the vacuum, neo-vacuum, at the end of pumping out and this stuck any floating gas that was still in there to the walls, so you got a much better vacuum in the – in the thing. So I knew all about that, so if you went round all your valves and looked to see if all the getters were nice and shiny then if one wasn’t then you knew best to – to change that and so on. Properties of valves were a great help to me, yes. On the other hand there was one particular circuit that Doc Booth produced and recommended to me and – which I said, ‘Never work, it’ll – oh it’ll
blow the valve to fury,’ a valve has an electric field of electrons in front of the cathode which protect the cathode and then electrons are sucked away from that field of electrons to go across the valve and do the work. If that electron field disappears then the cathode can be bombarded with other things coming in the other direction and ruined. The circuit that Doc Booth used, invented, I don’t know where it came from, but was a – a very very violent circuit, you took a valve and connected it up as an oscillator and you took all the anode voltage that – a great big swing and put it straight back on the grid in an inverse factor, so as the anode came down the grid would rise. And this huge voltage on the grid ten – sorry, twenty, fifty, even 100 volts would completely suck the shielding electron field around the cathode away, and that was real cruelty to valves and it’ll never work in the whole – but it did and we – we used them, yeah, all the time by thousands and many in the field. So that was a thing of not understanding physics was a good idea in that case. Let me think, physics and knowing about physics … well this is not really physics but it’s – it’s electronics on a higher scale. A tabulating machine company has a great big cable, an umbilical cord that connects it to the computer, possibly a mass of wires one and half inches in diameter and this cable may be twenty feet long and it’s got a sheathing on the outside which is a helical iron braid – not braid – it isn’t braiding, exactly what it is, it is actually a helix, a shaped helix which locks together between each turn all the way to the end. And we used that as the – the screen, the earth screen and also the return current as the earth to get it back – things back to earth. And … under certain circumstances the screening didn’t seem to be working, we were getting pick up and that sort of thing. And we couldn’t understand this again and one night working late at night, for some reason with the lights out, we – this … effect happened, whatever caused it and somebody says, ‘Bloody sparks,’ and in fact all along this coil of metal, because it was iron and had quite a lot of – I’m trying to think of the word, impedance to – to electric field, magnetic fields I should have said, the current coming back down the earth, rather than go round a simple turn of three inches jumped across, ‘cause it was more impedance to going down there than to jump across an eighth of an inch, which has always amazed me but it was so. So you looked at this at night and everything was [makes sound to represent flashes] [laughs], light – sort of small little lightning flashes all the way down. Now, I mean once you know that’s the problem then you put a proper wire in, but without the knowledge of physics and that sort of thing it would be more difficult to – to find out. Yeah.
Hmmm.

[25:40]

*I think we discussed the HEC4 machine in detail last week.*

Right, that was the one that went into the field, about 120 were sold, that’s right, all over the world. I’d … I then moved on and … this is where a big company well organised takes over, hundreds of field engineers would have been trained to service these things, all the manuals would be there, all the spares would be distributed round the world, everything was there that should be to – and the customers were trained on how to use it, so this was an – thoroughly professional standard operation for a big company like BTM, as it would have done with its tabulators or anything else, to get a product into the field, and they went in very satisfactorily. I cannot remember having been asked back to sort something out. In other words there was no trouble – certainly there was no logic trouble, that would have been sorted out anyway in the prototype, probably. So no – no problem at all, very very pleased with that indeed, excellent. Right, now do want me to go onto the next phase?

[27:01]

*Before you do I have one last question on the HEC4; I mean you talked about this – this sort of post-development phase when it goes into production and it goes out into the field, what’s your role in that?*

None if they do it right, they only come back to me if something doesn’t work. It’s entirely over to them. First of all there’s preproduction, men come in and – and breathe down your neck whilst you’re evolving the thing and you gets bit made in the production factory if you can so that when you come to produce it fully they know what they’re doing. They’ll already have made the chassis, they’ll already have made the – the relays, they’ll already have made the valve bases, they’ll already – the switch panels and so on, it will all have been productionised with real production drawings. So if that’s gone happily, yes. I cannot remember any real trouble during that process
at all, no, I can’t. But of course, again, a big company has a system of dealing with that. There is a small committee set up between the development people, the manufacturing people and the servicing people, the purchase people and the customer which meet regularly to – to look at the list of problems in the field and decide what to be done about them. For instance one machine may be suffering for high rate of valve failure and you find there is something curious in that, I wouldn’t have to go up there but the – they would be trained to know that that’s what they have to do. So there was a mechanism of dealing with all this sort of thing. For instance if something kept on failing then the – the purchasing manager would be in and he was told to go and buy a different component or get a refund or something, yeah, so all sorted out, you know, yeah. And so so different of course from the university environment, quite quite different, none of that would be in a university, why it should be there, ‘cause they weren’t reproducing the thing, yeah.

_Hmmm._

[29:06]

*So what did you do next?*

What did I do next? It was downhill from there on, as far as the technical world is concerned … GEC … why GEC … we had sold a HEC2M to GEC Research Laboratories, which was working all right. The GEC telephone works Coventry who effectively owned that computer in the GEC Research Laboratories Wembley ‘cause they paid for it, approached ICT and said, ‘We have just tried to get a contract with the British government for the Pyestock gas turbine research laboratory and because we hadn’t got a computer in our list of our armoury we lost the contract,’ to say Metro Vic or somebody, ‘so we feel that we must have a link with the computer world.’ British Tabulating also said, ‘Well we’re not really manufacturers of mass produced electronics; electrics yes, electronics no. We feel since you are electronic manufacturers you should be able to help us make things,’ we have had a bad experience because we put our certain chassis to be manufactured for us by Plessey and their quotes were way before – below what we could do it for, so we were very happy until bills started to stream in every time we changed something, even
minutely. The price of a change was horrendous, because in a mass production thing that – it is horrendous, so our love affair with Plessey to try and get them to mass produce things at a reasonable cost was no good. So BTM and GEC decided to set up a joint organisation called Computer Developments Limited, CDL, which would have equal staff from BTM and GEC and effectively they said, ‘We’ll see what they come up with,’ again completely open minded, they just – oh, and a board of directors from both sides who were technical, or understanding. The chap on the British Tabulating Machine Company side was a – a very good man called Arthur Humphreys, who was in fact an accountant but extremely – he became managing director for a bit later on, tough … personable chap, and on the GEC side the – the boss of GEC telephone works Coventry, E.C.H. Organ called ECHO Organ was on the board, two fine men in their different ways. I and another chap who soon faded away were allocated to join this company which meant moving to Wembley, and two chaps from GEC. The boss was a GEC man called D.C. Espley, Dr Espley, Dennis Espley, he’s dead now so you – he was rather like Womersley had been, he was an organisation man, a fighter cover man, but didn’t understand what was going on. So he was roll – steamrollered flat after a bit, and he was also a drunk, he really was a drunk, he’d come back from lunch at about three thirty, he’d lock himself in the office and you wouldn’t see him for the rest of the afternoon, that sort of chap, quite remarkable. But anyway, got on reasonably well with him, don’t get me wrong, but he just didn’t interface with – with the boys any longer, he didn’t know what was going on and how – you can imagine because it was a highly technical front end thing. He’d made his money and name … designing and developing a radio telephone link between … well Wembley and Coventry in – in – well, you know where Coventry is, which was very satisfactory with – the microwave with great big disc aerials. Which he did well on and was well thought of … then what happened? Oh yes, then GEC put in some more good chaps, we’ve had John Wensley already haven’t we, we’ve talked about him. Who else did we have in there? GEC – Espley brought along what I could only describe as fighter cover, a chap called Norman Bligh who was an administrator, a very nice chap that covered for this drunken boss, then what else, who else was there … Anyway, I don’t think we need worry about the other people because they – they fade out from the scene and – and they were dealing with other things that didn’t happen and so forth. So … John Wensley and I were really the people with the brains, I mean by brains I mean the technical brains and the inventive brains, so we
settled down to think, what the hell are we going to do? Now this didn’t worry us
because as I was – you asked earlier what – what having a – a research background
from university gave you, well it gave you the ability to start from scratch and decide
what you’re going to do. So we wrote little reports, P1, P2, P3 and P4 they were
called, they were probably four pages each, if that, on ideas which we put forward on
what CDL should do with the two companies joined. And it was decided that – I
can’t remember what P1 P2 were, but P3 was the suggestion to develop a computer
and this of course was exactly what our bosses want to hear. So … John Wensley and
I – me providing very much the technical commercial input, what the field needs,
what is needed out there for the mass market for a punch card machine installation.
‘Cause the punch cards were still there in vast quantities and they were the market that
we had to sell into and they were our captive customers that we had to meet, what –
BTM had or had possibly 5,000 of them, you know, really big area. So I knew what
they needed, how much input, how much output, how much storage and all that sort
of thing. John helped with the logic. I suppose my greatest contribution to the design
of this P3 machine was to say that it had to beat as it sweeps as it cleans, as which is
what Hoover said, it was Hoover’s motto, but what I meant by this was it must input
information from cards while it’s computing information from the last card, while it’s
printing information from probably the card before, so when I say card that is what is
going through the tabulator. You notice there’s no sign of magnetic tape yet, that had
not appeared on the scene, paper tape was hopeless for commercial work because you
couldn’t sort it. So, it was quick enough but it just couldn’t sort it. When have we got
to now? Right, so John Wensley and I were given the enthusiastic go ahead to
develop this machine as quickly as we possibly could and … so John Wensley and I
started out on the – the – the block design of the parts that were going into this
machine and I then … left being a technical man really in being the link between GEC
Research Laboratories, BTM manufacturing at Letchworth, Stevenage, and CDL, so
my job was the technical job of making sure all these people knew what was
happening and what they were committed to by when, so it was a management and
planning job, whilst John Wensley settled down to the detailed logic of the machine.
This was all at a place called Kenton where we had a – a three storey building, and by
this time we’d probably got twenty or thirty people in, that was – give Espley his due,
he – he fought like fury for getting staff aboard and staff of the right calibre, he had
the right idea did Espley, he knew … what he wanted, and the other good thing he did
was he insisted that the machine had a – appearance designer associated with it, which is something that Hollerith had never had before, what shape’s the box, what’s the can like, an appearance designer, a physical designer, there’s a word for it and I haven’t got the correct phrase yet.

*Is it industrial designer?*

Yeah, good, bang on. So – and he – we had never used an industrial designer before … the computers made by BTM were clothed, and that’s the right word, by the sheet metal boys and the steel metal boys had often been car metal bashers, making wings and all the things to cars, and when we developed this – computers we had to have a cover round it, which you’ll see pictures of the covers. So the covers man, a very skilled metal bashing type bloke whose name I forget, and history deserves for him to be remembered but I will think of it in a minute, came along literally with a tape measure and a piece of paper and measured this box and came back with the covers, it was like – it was like a suit of clothes, you know, exactly, all the corners, the fixings, where you want the door, absolutely – you were saying when we were talking earlier about a lab technician, he was more than a lab technician, he really was, he was a superb man and he’d been doing this all his time for tabulator – and you see a tabulator is not a standard box, you can have so many bells and whistles on it that every box – not every, most boxes are different, so there’s another three rows of relays on there or there’s a thing for paper there or something, or another socket there. So all the time tabulators are being handcrafted, their covers, to fit what the customer wants. So he did this with the computer covers no problem. But going over to Espley, he wanted industrial design as it should be done, where you – you study what the customer has to do, where the inputs and outputs and switches are, the lighting, the weight, the colours, it’s not just colours, which often people think it is, not at all, so it – he brought in a small firm called Noel London to do this, which we worked with very satisfac – I was very pooh-poohy, ‘Oh bloody hell, don’t want them sort of people round,’ I was wrong and this chap was absolutely excellent at – at helping us getting it together, ‘cause he looked at the ergonomics of the whole business too, how – how you would service it, how the plugs went, how it would be transported, all these very good things that we normally didn’t think about. What time your train?
Train isn’t until a little after five actually.

Okay. Right. Let’s go on for a quarter of an hour, then take a quarter of an hour walk round the garden, is that all right?

Sounds good with me.

Okay, good. So where have we got to now, we’ve got to an industrial designer being appointed to this machine.

[42:11]

We’re now – moved away from GEC Research Laboratories Wembley to a special building called CDL at Kenton, where Espley, again give him his due, everything was there, we got our own canteen, we got our own driver, we got our own drivers – our own garage at the back, library, yes, from that point of view excellent. So …

Wensley designed the logic for the machine, which was the same as the drawings you’ve seen there only for this different machine, and the machine was a – I haven’t mentioned its properties, firstly it was transistorised, that’s the vital point, it was transistorised, no valves at all, transistorised machine, and high pulse repetition rate, I think a megacycle whereas my machine had been thirty kilocycles, so a great speed up in – in that sort of thing. [Sighs] … I’m forgetting the – the fundamental principles of the machine but I will look them up in a minute. So this machine had masses of gates and shifting registers and all that sort of thing in it, and in order to check over the logical design John Wensley very sensibly said, ‘We’re going to … mechanise, humanise this, we’re going to draw out the whole of the logic design on the conference room floor,’ which was a – about as – as long as this room – room and about half as wide again.

So how – how big’s that?

Well – oh I see, yes, you’re damn computer doesn’t know does it. Thirty feet by twenty feet and the whole of the logic design was drawn out with its gates and its wires on the floor of this room. And then human beings acted as pulses, a – a pulse of
information, a voltage which lasts for say a millisecond, right, so a computer consists of pulses tearing all around the place at a megacycle. So … people were stood representing pulses at the correct place in the circuit and then … in order to check that a particular operation is correct, say an addition, the – the number being added would be a stream of pulses, one after the other, so human beings were – there’d be a row of these human beings and they would march onto the machine if you could like – and told to move to the next point round the machine like this as we said, ‘Okay, pulse five, pulse six, pulse seven,’ they move around like that, with each time seeing that the effect of them being at that point at that time didn’t clash with another one, or they’d got somewhere to go and it wasn’t shut off to them. So the logic was checked out by this walkthrough process, and it was extremely successful and we did find various clashes where two pulses tried to get on the same spot simultaneously, or – or alternately their – their path is blocked and they should go on. So it was a very good way of debugging many of the initial thoughts, so that was a brilliant thing that John Wensley did. Right, so we’ve now – then there was the input and output which had to be arranged from BTM, but that was standard punch card equipment, modified to do what we want to do, just the same as it had been for the HEC machines. So the punch card reader now ceased to be a – a black box on Queen Anne’s legs with, you know, crinkly covers, now a nicely styled box with switches and lights and colours and so forth, so it was a smart looking machine. The other thing which I haven’t mentioned, this machine had the advantage or disadvantage, whichever you like to look at it, with having as few plugs and sockets as possible, the circuits on their circuit boards didn’t plug in, almost invariably up till then circuit boards had a row of plated contacts, gold plated contacts which plugged into a – a socket three five ten inches long according to how the big the board was, and these always gave trouble. When anybody said, ‘What is the first cause of faults in your machine?’ it’s almost always plugs and sockets, so they were a pain in the arse were plugs and sockets, however well they were made and however expensive they were. So GEC Research Laboratories had – sorry, GEC Coventry had had this trouble before, so they proposed that we used wrapped joints. Now this was a new technique and that meant you took two contacts, which instead of being plated surfaces were square cross-section wires, and put them side by side, perhaps they might be half an inch high and then wrap a wire round them, an ordinary bit of solder plated copper wire, and as you wrapped this wire round it bit in at each corner to the rectangular surface, actually got a good metallic contact
at that point, so if you wrapped twenty turns on there you got eighty – eighty points where things had actually with luck cut through any resistance or what have you, and they weren’t bad at all, they were – they were good contacts. The trouble was of course that the way of servicing a computer was serviced by substitution, which meant that you didn’t change the individual resistor, capacitor or whatever it happened to be, or transistor at a particular point, you took the whole board out and put another one in. The board then went back and somebody else sorted out what to do on that board, whether to junk it or repair it. But so this meant if you came to this machine to get a board you’d got to undo twenty or thirty of these wrapped joints, put a new board in, wrap it in and then try it. So this was desperately slow and there was a great row between GEC and the service men and ICT, I think it was by then, who had to maintain this machine, they said, ‘No way can we ever maintain it this thing,’ so there was a fight and GEC won and it did go into the field and then [laughs] the field engineers being the field engineers invented something to get round these bloody wrap joints and that was a row of rubber holes in a strip, each rubber hole corresponding to where these little wires were supposed to meet together. So if this was pushed on – over a row of holes, it pushed these things together and it – they would conduct, make a reasonable joint, not forever, but long enough for the thing to be tested and find out whether that was the faulty thing was, then this rubber thing was taken off and the proper thing put in and wrapped again. So that – that went in and it was quite a remarkable thing to actually get into the field, and hundreds of the machines were made with this one. Out of interest, when I went down to see the one remaining machine that is working, or nearly working, down in Kent, low and behold at the back of this machine masses of these rubber things were in all over the place [laughs], so they were – anyway, there we were. So that was that. So we’ve dealt with wrapped joints, we’ve got that – we’d chosen that it’s going to be transistorised, which means that the room must be air conditioned it’s in, which was a change.

[50:37]

And it was also a magnetic tape machine, so this is the first time we’d had tape drives attached to – to the machine, so we had rows of tape drivers which caused their own troubles, particularly a thing called synching. If you’re a – a magnetic tape reel starts and stops, starts and stops in jerks, that the – the tape going on has a tensioning device
to make sure that it goes on at the same tension all the time, however for various
reasons this tension varies and so that after a time, when you’ve got a big thick reel of
magnetic tape, perhaps four or five inches of tape deep, the inertia of that tape is so
high that when you tried to accelerate it or stop it the outside rim of tape – of perhaps
five inches of tape, will skid over the inner tape and there will be a ziggle ziggle
ziggle of – of concertinaed tape between them, very difficult problem to sort out, but
they – they did sort it out by way of controlling the … what do you call it, servo
mechanisms for the start and stop of the tape, AMPEX was the name of the tapes, or
was it ANELEX, ANELEX or AMPEX, I think AMPEX, ANELEX I think had the
printer, was the printer, American. BTM however did have a – a good courageous
failure with setting up a – a magnetic tape development company, separate company
which we – BTM supported but it never really managed to develop a – a product
quick enough to defeat the Americans who were flooding the market. Pity but there it
was.

[52:36]

Right, so we’re – we’re developing this machine, run through the logic at Wembley,
shipped the whole thing to – the design to Coventry where the prototype was made in
GEC Telephone Works Coventry where there was a whole new range of people we
had to interface with. ECHO Organ was the boss, Colin Ladds was the head of the
development laboratory out there and George Gibson was the man actually in charge
of this, all fine – fine chaps and – and no problem at all. Except they were bastards,
yey challenged us to a game of golf, and we’d got some very very good golfers on
our side, and GEC Telephone Works was right next to a very nice golf course which
was the GEC Social Club, I – call it the Abbey, it wasn’t the Abbey but that sort of a
name. And so we went up to play them and they laid on an absolutely super dinner
the night before and we had super lots of wine and absolutely grand, we woke up next
morning feeling absolutely dead and went out to play these blokes and we thought,
well don’t worry, but they’d field a different team of [laughs] – for [laughs], so they
said, ‘Oh no, that was our drinking team last night, you’re now playing our golf
team,’ so anyway we were thrashed but we deserved it. So we got on well with GEC
Telephone Works, developing the machine, there were various inter company rows
which I won’t deal with but they weren’t – weren’t in my sphere except I was the
bloke trying to sort them out. I was then tearing up the road to Coventry and back again very regularly sorting this out. ECHO Organ was a drinker, and again you had to be able to take your liquor to get on with him, and we went out have – what were really absolutely smashing dinners in various pubs, we were near Stratford-On-Avon which has got lovely hotels there and all sorts of pubs. So a good time but a very boozey time and a tough time, but nevertheless rewarding. So – but I was a manager by then, I was a manager by then, I was a manager that understood what the bits were, now that I think is vital ‘cause I’d done it before. I wasn’t like Espley who’d never done it before.

[55:11]

So the – this went on very well and programming had then come to the fore. The first lot of machines, the customer wrote his programmes, the store in the machine was relatively small, so the computer – the programmes were relatively short. BTM did provide certain subroutines that the customer could have and feed in as a pack of cards, but the customer was trained to programme his own machine, but by the time we got to the 1301 it was much more complicated, there was mag tape on it, oh and a core store in the middle of the machine to have the intimate store in the machine, and – instead of a drum. So programmers, of which there were probably twenty by this time at Kenton writing various routines to control this, control that, control the other, had to go up to Coventry and we were working day and night programming this sort of thing and hotel rooms were booked for us to go and sleep any time of the day and night, which worked well and we got through that sort of thing all right. The machine went into the field, sold reasonably well, but it lacked various features that the market was now beginning to demand, communications equipment was one of them. Now that was a – a terrible gaff really ‘cause when you think communications, that’s why we signed up with GEC ‘cause they were supposed to know about communications, which they – they did but they hadn’t realised that the customers were wanting to join computers together and join pieces of apparatus over a telephone line to the machine. So we had no means of joining up to telephone lines, which was a serious mistake. However – and also we couldn’t make them quick enough, the demand in BTM for this machine far exceeded the rate at which GEC Coventry and – and Letchworth could make the thing.
So the next phase of the world was me getting on my bike, under a chap called Peter Ellis that we must talk about. Peter Ellis, again a remarkable man ... he had ... been a – an actuary, I think, certainly an accountant. He went to a prestigious Manchester – not Manchester Grammar School, it might have been Manchester Grammar School but anyway, a good – good school, he’d been a wireless operator in the war on – on tankers and those sort of ships and survived that little lot, he’d come back and he was in Power Samas. By this time BTM and Power Samas had amalgamated and become ICT. Is that a suitable time to stop?

For a break, yeah.

Yeah, anything you want to talk about what I’ve said so far about the 1301 or do you want to think about that for a bit?

I have got a few more questions which we can either cope with now or do –

Well let’s have a little walk around the garden.

Okay.

[End of Track 11]
Track 12

[Laughs] I was interested in the way that you described the process of how the 1301 came into being.

Yeah.

So it almost sounds like you – you were quite separate from the prototype being built?

Physically?

Yes.

Oh yes, yes yes.

Yeah, so it's been designed in one place but built in quite another one, I was just checking I've got that right.

Yes, but of course the people that were going to build it were with us all the time, so they saw what was happening. So the – the logical diagrams went straight up to them and they decided – they then set about the physical design, quite right, to our design, our framework 'cause, you know, all the chassis, the framework, the covers, all that was done by them up there. But to our – our design. So we were design consultants – no, more than consultants of course, more than consultants, we were the design authority, that's the word I'm looking for.

Hmmm. Are there any problems with that sort of relationship, you know, working in two different sites on the same problem?

Not that I remember, not that I remember. I said there were some problems with BTM, that was purely a matter of evolution and – and delivery of bits, so it wasn’t a fundamental problem.

Hmmm.
Let’s just think what else to be said. By this time, as I think I mentioned, Hollerith had merged with Power Samas to form International – ICT, not ICL, International Computers and Tabulators. That merger was painful as you can imagine, two companies having to merge so one bloke – one job for two blokes and that sort of thing. Hollerith thought it was the senior partner and the boss but it turned out otherwise that several of the – the Powers people were bloody good at their job and got whatever it was.

How did the company change when the merger happened, from your point of view?

From my point of view it didn’t matter ‘cause I was working for CDL. I mean yes, a different crowd of people came through the door and you talked to them and – as colleagues and so forth. Didn’t really get much trouble, except of course there was the natural loyalty to – to round holes or square holes, rectangular holes and so forth. Sorry, you’re looking at me.

Round holes or square holes.

Oh [laughs], oh my dear Sir, Power Samas use circular holes in their card, Hollerith used rectangular holes in their card, and for very good reasons, but – but – do you want to hear? All right, well.

Yeah.

… In 1890s the American census were having terrible trouble with the vast mass of information from all over the – getting – it took longer to get the results worked out than the time to start the next census so they decided they had to do something about it, so Mr Powers came along and said, ‘I’ve got this piece of cardboard and if you punch holes in this piece of cardboard I’ve got a machine we can feed that into which
will count the numbers punched into the cards,’ so that was set up to do the census and the how – the machine was entirely mechanical with rods that went through these holes and worked levers and things like that and clicked round counters. So that happened, but then why this happened I don’t know, the next census – another chap came along, Mr Hollerith, who had said, ‘These round holes are no bloody good, they’re all mechanical, I mean I’ve got relays on this and once you get a relay set up then with wires you can do all sorts of things, much more flexible,’ so the – the cards which are now the IBM card with slots in came along and they were sensed by little wire brushes falling through these slots over a – over a roller, so that in – what I’m trying to say is the hole didn’t – didn’t want to be round, it wanted to be rectangular. So two ranges of equipment, both pretty good, hit the field and it coexisted for fifty years and all over the world there were installations of both sorts, the Power Samas people usually taking the – the lower end, the cheaper end and the Hollerith and IBM – IBM as it became, the top end. What else to be said? And the same happened in the UK, that’s what I should have emphasised, that there was a Power Samas company in the UK and there was a … a BTM using rectangular holes in the – in the UK. So it – it became sensible that the two companies should merge which they did.

_Hmmm._

[05:40]

_I’ve always been interested in the fact that you refer to BTM as Hollerith and I’m just wondering how much within BTM there was that awareness of, you know, that Hollerith legacy really, what sort of sense of its heritage was there in the company?_

Oh very strong, yes, goodness me yes. I mean all the – a lot of the drawings about the place, quite a lot of the punch card components, the relays, were undoubtedly American design that came over from Hollerith.

_Hmmm._

Did this affect us, very little, really. No, but it – it was a sense that, yes, that’s – that was our historical evolutionary route.
Hmmm.

[06:31]

*How much of a change was there – the 1301 development process from the earlier computers?*

… [sighs] A great one, the 1301 – sorry the 1200 range was a one man band … I did the logic – sorry, I did the system, I did the logic, I did the physical layout, I effectively did everything and it was all mine. Except the punch card equipment, now I mustn’t forget that, which is a very important part of it, but there again there was as I say a highly professional group of punch card evolutionary engineers that made specials for everybody, so mine was just another special, so I specified what I want to a chap that came around with this thing, bloke called Cyril Meade who went away and make sure we got what we wanted, yeah, absolutely super.

[07:31]

Going back to … the Power Samas … Hollerith legacy and how it affected the 1301. Very little because of course we were looking to GEC and also … the punch card equipment was Hollerith which is what we’d used on the previous machine. Power Samas didn’t come into it but they did, because what had happened then was that British Tabulating Machine Company had a planning division up in London which never caught up with electronics at all and became – I can only describe it as moribund and almost superfluous because the computer world had galloped ahead around Espley and – and John Wensley and Dickie Bird and so forth, and so it was decided that the boss of the – of the planning division in London would disappear and CDL would take over and become ICT Planning Division, so that happened. But in this process we inherited, we, yeah, CDL inherited a chap from Power Samas called Peter Ellis, put that in capital red letters, an outstanding man who I have just mentioned before we … went for a break, highly intelligent, highly intelligent. He had been on the marketing side of Power Samas, they had a charismatic marketing man called Lyon Lightstone, who could charm the birds off the trees, a super gift of
the gab, but behind him was the brains which was Peter Ellis, so they made a marvellous marketing team, much feared by BTM before we merged. And anyway Peter Ellis came over to be Don – Dennis Espley’s number two, but there was no contest from the word go, I mean Peter Ellis was the boss and that was this and Espley went on drinking and that was that. So … we had now got Power Samas people with us as well … what else to be said about that? We were now – 1301 was drifting away from us to be made and – and sold … we – I personally was one of two department heads under Espley in the new planning division and I was responsible for planning new add-ons and attachments and tape systems for the 1301, and … I designed and got made a particular tape system which was brilliant but a failure. That sounds funny. As I was telling you, there was all sorts of faults on magnetic tape, particularly this synching problem, but also digits got lost and all that sort of thing. So I … designed a system which had error detection and correction built in. If you can think of a number, say eight digits, then if you string onto that possibly four or five other digits, if there’s any fault in the first eight, or in these four or five digits because either could be corrected, it could correct itself and the output would never know it, so the thing just worked. So – and these things did work and they worked bloody well, but they were too slow and too expensive, so there you are. And tape systems got better, so this particular development of mine had an early but honourable death, so that was that. There’s – yeah, you could say over engineered, yes, you were right, it is, it was.

[Laughs].

[12:00]

Now what else to be said? So I – we had now moved to a bigger office block at Harrow, just by Harrow station, because there were more of us and we had to do more things and – now why was it then, I was getting fed up with the journey, a long journey to my home to Harrow so I said, ‘Look I want to move, can I,’ I said to – oh, another question, we haven’t mentioned that ECHO Organ, who was the boss of GEC Telephone Works was poached from GEC to come and run British Tabulating Machine Company’s development installation at Letchworth, so ECHO moved across and eventually moved up the tree so he became almost deputy managing director up the top. Partly successful partly – terrific man manager, terrific image and so forth,
yeah, a drunk, but yeah he – on the whole was pretty good at managing. So I went to work for him based at Stevenage by this time where new research laboratories are being built for British Tabulating Machine Company and I went as his data processing manager, so I had a – a nice swish new computer room built with a – by that time we were getting another range called the – oh I’ll have to go back in a minute, called the 1900 range which superseded the 1301 which went into there on the thing. But why I must go back is that whilst I was at Kenton Harrow with the – the new ICT planning division, Peter Ellis and I and one other chap was sent over to America to look at … RCA Development Laboratories, because they were making a proposition to us, ‘Come over and look and you’ll see what – see what we’ve got, you know, what are you wasting your time for, we’ve done it all,’ sort of Yankee stuff, not quite – they were bloody good, I’m not – I’m being a bit naughty then, but they were trying to sell to us for money access to all their development and all their machines, development computers which they were satisfactorily making and selling, they’d got a – a whole – the RCA301, the RCA501, very satisfactory machines delivered. So yes, BTM signed up for this, ICT signed up for this, Peter Ellis and I were going backwards and forwards talking about things, and two things happened. One is we visited their 301 manufacturing facility down in Florida and I was astounded, I went into this place and there was a vast area with rows of computers, probably thirty – twenty, thirty on the floor, plaques on the wall, each plaque a computer they’d delivered at one of these times, possibly 300, 400 of these plaques on the wall, by which time back home we might have delivered fifty, you see what I mean? And then there was a stores and I said, ‘Where’s your manufacture?’ ‘Well this is our manufacture,’ I said, ‘No, where are all the bits made?’ ‘Oh, they’re all subcontracted,’ I said, ‘What?’ ‘Oh yes, all our boards go to him, the switches done, the power supplies and,’ and there was a vast – in America subcontracting business so you didn’t have to make everything, you – you put out a – a spec and the subcontractor made it and delivered to the spec and if he didn’t he had his neck wrung, you know, that sort of thing I mean. So there was this vast computer hall which really consisted of – of a stores and a – and a – a final assembly, brilliant, absolutely lovely. And so – and also they had communications attachment to the 301, which was very similar to the – to the 1301 in – in power and what have you, transistorised and the rest. So a deal was done to buy some 301s to augment the 1301s, so BTM – well it was ICT then, delivered both 1301s and 301s, I cannot tell – RCA301s, I cannot tell you what the numbers of each were, but that
happened, so Peter Ellis and I were both concerned with that. Also it was decided that we would develop with RCA a joint machine, a small machine at the bottom end of the range which was called Poplar, because RCA called their machines by the name of Poplar, again British Tab would make the input output, and RCA would develop the electronics for the central processor. Peter Ellis and I were responsible for the – laying down the outline of the spec that we needed for this machine and this machine was being developed both for ourselves and for RCA. And the – I liaised with the RCA West Palm Beach development engineers, great lot, got on with them very well, made very good friends with them, it was in the middle of a swamp with – surrounded by alligators, but that’s beside the point. And so I liaised with them, visited them often, went to spend a month now and again with them in West Palm Beach, lovely time, gorgeous restaurants, and so – but joking apart, excellent development coming along well and then the bombshell hit. IBM announced that they were producing a range which was compatible from the bottom to the top, completely compatible, that if you wrote a programme on the smallest machine it would run on the biggest machine, that as the – your business grew, you could add more of the range onto it, and you would never have to scrap your programmes, retrain anybody, it was compatibility top to bottom of range, it was called the 360 I think, almost certainly was the 360 range. And this was an absolute bombshell. And Peter Ellis, who could turn around on a pin’s head said, ‘Christ, we’ve got to do something about this, got a piece of paper?’ and I pulled out the punch card and he drew a line down the middle of this and said, ‘Now what can we do with this?’ so we put down central processors on one side that we’d got and peripherals on the other side to see if we could do a similar range. So by the time we got – ah, the other thing is, RCA had said, ‘Sorry ICT, this 360 completely alters the picture, we as RCA only survive from the crumbs from IBM’s table really, but in order that – the American government don’t want all their eggs in the IBM basket so we get business, but unless we can have a compatible or pseudo compatible range of equipment we’re out of the government business which is so dominant in America,’ so they said, ‘Sorry, Poplar’s off, but we made you a promise, we will develop this machine [coughs] for you, and also if you want to join us with our IBM compatible machine you could do it,’ and Arthur Humphreys bless his heart stood up and says, ‘Thank you very much RCA, that’s a very generous offer and I regard it as a gentleman’s reply to a difficult situation, however, if you think we Brits are going to pussy foot after those bastards IBM you’re wrong,’ [laughs] which
was [laughs], a real Churchillian statement it really was. So with this punch card, with this machine, we came back to Britain, terrific meetings between what – who’s going to do what and how it was going to be compatible, and the 1900 range was evolved, so I was right on the – the front door of that, but again I still drift – very soon drifted out of it, but having put in that first punch card with the things down, what have you, this punch card where we divided – our central processor’s going to be those, our peripherals are going to be those, what happened then was I was sent off with a chap called – oh, West Gorton and Stevenage were two halves of the – we’d merged with Ferranti by then, sorry – sorry, that was yet another horror in this and we’d also merged with EMI of course, so oh dear. So anyway, we’d merged with Ferranti, so Basil Ferranti was pussy footing around during this time, I’ve forgotten to – to mention that … so we hadn’t got a machine at the bottom end of the range of this 1900 range we were going to develop, so we looked at Poplar and said, ‘No, we’re going to do it ourselves,’ then some Stevenage designers and some West Gorton designers both put ploys forward as to how to meet this thing, the answer to this question was known already and that was Stevenage has got to do something and West Gorton’s going to be dealing with the big machines anyway so we can’t possibly clutter them with a small machine, so I and the other chap doing – we knew what the answer’s got to be, so we said, ‘Yes, it’s the Stevenage machine.’ So they developed the – the 1902, 1903 and the 1903 upwards was developed by West Gorton who used some – I believe some Ferranti Packard input. Right, so how’s about that?

_Hmmm._

[22:34]

_I’ve got some follow-up questions I’d like to ask you?_

Right, right.

_As always [laughs]._

What time have we got to leave?
I think if we wrap up about five I should be good.

Okay, good.

[Clears throat] I was really interested in your trip to the States, what were your other impressions of the American computer industry compared to that you were used to in Britain?

God help us, just the name I – when I got to China now, I think god help us. Follow that, you know, yes, they were far better than we were and steaming ahead. [Coughs]. There was nothing wrong at all with British engineering brains, nothing at all wrong with that side at all. The ability to narrow down the field of effort, merge the computer companies in the UK and fix a target which you charged forward was somehow foreign to our nature, our managerial nature. So we never – we always altered it, changed it, merged with something, and of course we hadn’t got the same market size, though yeah, shame, but no I was – oh the other thing of course, the American computer industry was – was – was – there were all sorts of bits to it of course and it was completely ruthless, you know, if something didn’t work that was out, you know, and all to the wall and somebody else charged forward. So it was one big fight. I was very impressed with them collectively, individually … I never met any people quite of the calibre of say Peter Ellis, yeah, interesting. I never met a manager of the calibre of Arthur Humphreys, I met plenty of managers of the calibre of ECHO Organ, though they weren’t drunk. Trying to answer that question a bit more … less humorously and more cerebrally. Seeing how America organised itself … with its total dedication to a particular target which they usually didn’t alter and just went straight at it … their ruthlessness in discarding designs, people or companies that didn’t fit … their use of subcontractors which meant that there was a great pool of specialist companies that could feed your power supplies whatever it was into the main thing, we had to use some American subcontractors, say for magnetic tape, but in general we – there was a – not invented here, let’s do it ourselves. There wasn’t – because there wasn’t the demand and there wasn’t the size to have a – a full scale subcontractors. We did use ANELEX printers which we – you would have thought that British Tabulating should be able to develop a printer, they’d been doing it for sixty years, but oh no, there was a big development organisation developing printers
but they failed dismally I’m sorry to say. I’m sorry to say, very sorry to say. That was under ECHO Organ at – at Stevenage, Letchworth, Stevenage.

[26:34]

You mentioned – a moment ago you mentioned that the Americans tended to just sort of plough on, finish the project without changing it.

If they possibly could.

What was the difference in Britain in comparison?

Oh this is hard to say, often a particular client and a particular contract that had been signed had an impact on what was being developed and delivered. There was one brilliant piece of evolution that did happen in – in the UK in British Tab, and that was that one of the engineers working at Stevenage noted that we kept on having to fit a particular piece of tabulating equipment, printing in particular, to an individual computer. There were two big Ferranti machines, Skandinaviska and Enskilda Banks in Sweden, I think I’ve got the names right, who needed a special printer fitted to those two things, so Hollerith found itself spending a lot of its development effort interfacing peripherals for one or two customers only, great waste of development engineering. So he proposed – his name – name will come back to me in a minute and he’s a man that should be remembered for prosperity … he proposed a standard interface, that means that like a thirteen amp plug only much more complicated. There would be a set of connections, lines, that did certain jobs like on off to be crude, address of where you wanted to get to, area and so forth, in a plug and the peripheral would be developed to the standard interface, and the computers would be developed to the standard interface, so the smallest to the largest could take a particular peripheral if it wanted it. Ron Feather. Ron Feather was the name who developed this, unfortunately poor chap was killed in a motorcar accident, but a very nice bloke indeed, but it was a – it’s a crucial development that was. So when Poplar, this machine with RCA was being developed, the peripherals for that were designed to the standard interface, so Poplar would have had a standard interface on it. And of course the 130 – sorry, the 1900 range had a standard interface on it, so the concept had been
thought of before the 1900 but it was absolutely the right concept and when you know about it it’s bloody obvious, but most good suggestions are bloody obvious.

Hmmm.

[29:54]

... Could you just give me some idea of what you were looking for above the HEC4 machine in the 1300, or 1301 rather?

Well magnetic tape was the vital thing. Because there had no – with the – the 1200s, there was no method whatsoever of carrying forward your stores, whatever the numbers, you had to punch them out onto punch cards and feed the bloody things back in again. No – and there were also [coughs] – there was no vast store of numbers that you could scan through, you hadn’t got your customer information all on one file, accessible to the computer at any time, like I’ll take that that and that. Which is what mag – magnetic tape did for you. So magnetic tape was a vital thing that had to be on the – the 1301. Everybody understood about magnetic tape, it was just getting a – a good reliable magnetic tape drive which we got from America and I’m trying to think who we got it from, it’ll come back to me in a minute. Yeah, printers the same, a good printer, so we got that as I say from ANELEX in America. AMPEX was a magnetic tape drive, ANELEX were the printers. I visited both companies … focused I suppose is the best word I’d use for both of them, they knew what they were good at and that they were going to do.

Hmmm.

And of course they all had numbers of customers which they had to juggle all the time.

[31:49]

Were you looking for any other advantages over the earlier computers?
What when we went to the –

When you went to the 1301?

1301, well I should have put right at the beginning transistors, as compared to valves. A thing that didn’t glow and burn out struck us as a good idea. So the other thing is as should be said and I’m – got to get this quite right, the first transistors were germanium based, now I’ve got to get this right, and the later transistors were silicone based. The germanium ones were more susceptible to temperature, and so you had to have an air conditioned room to hold them in. I’m going to spend a penny and then I’ll come down [break in recording] – okay, I’ll give you a quarter of an hour ‘cause I’m getting a bit tired.

Okay.

Okay, right.

[32:51]

This is a … a bit of an aside, but it – you’re interested in the evolution of the computer industry and what happened and this was something that I was only very vaguely engaged with. Both Hollerith and Power Samas made calculators, as I think I was explaining to you. When the computer world came along there was a feeling that the calculators were dead and no further calculators were satisfactorily developed by BTM. However, out there in the field there’s – Arthur Humphreys was boss at the time, there was a – a great mass of customers, both Hollerith and Powers, that weren’t big enough for computers, all they needed was a good calculator which is cheaper and smaller and fits into the existing installation. UNIVAC quietly, secretively, contacted BTM, Hollerith – let me get it right, ICT and said, ‘We are quietly developing this machine, it is a … punch card calculator, it’s going to cost so much, it’s going to be so big, are you interested?’ and BTM said, ‘My god, if it works, yes we are,’ and this was called the UNIVAC 1004, beautifully designed little machine. For reasons within UNIVAC which I can’t remember this had to be developed very very secretly, so they did things that they do in America, they took engineers physically and moved
them and kept them almost in purdah to develop this machine in a barn somewhere, that sort of idea, and a brilliant job it was too the 1004. And Arthur Humphreys, who’d got a lot of things to his credit, went over there and ordered 100 of them on the spot, very brave man indeed which he did and they were delivered and they were a godsend to – to the company ‘cause they saved that number of customers either scrapping punch cards all together or – or joining IBM, so the 1004 was worth mentioning as a – as a stepping stone.

Hmmm.

[35:25]

Arthur Humphreys has popped up a few times.

Yes.

Could you give me a little flavour of what sort of person he was?

He was a man; a craggy … self-opinionated in the nice possible manner. Brave … cerebral man who had on the whole an extremely good sense of judgement, not easily swayed by rumour or what have you, and … I enjoyed working for him. He liked drinking, not to excess though, I’d never known him drink to excess but for instance – oh and the other thing is he only needed about ten hours – sorry, two hours sleep at night, he would work to god knows what hours of the night and – for instance we go to New York, before we saw ICA and we’d been in a room – a New York hotel and he’d say, ‘Get – we’d better have a game of liar dice,’ that was his fav – do you know liar dice? Liar dice is like poker with dices, and you – you have your hand and you have to bid on it and you would bid on something and then you’d say to the bloke next door, ‘Do you accept or don’t you accept?’ and the bids would go up and up of course. And the other bloke would say, ‘No, I won’t accept,’ and you turn it over and it’s perfectly valid. Alternatively he says, ‘Yes I will,’ so you’d pass it across and have a look at this, and it’s a load of junk of course, and he’d look at this and say, ‘Oh, well I’ll change that,’ you could – you know, it’s like poker, you can change things and pass it onto the next chap. This is teaching you to lie, this is [laughs] – it’s
teaching you psychology and how to lie and Arthur – I mean I – whether he
consciously worked this out that this is what he was doing, teaching his staff how to
lie, but it was teaching you judgement and how to negotiate in various ways. So we
used to play liar dice to all hours of the – in the morning, I remember one time we
were in a big hotel in New York and we’d run out of scotch and Arthur said, ‘Go and
get some more scotch Dick,’ I said, ‘Arthur it’s three o’clock in the morning,’ and he
says, ‘This is New York,’ [laughs]. So I’d go down and get in a taxi and say, ‘We
want some scotch,’ ‘Yeah, sure brother,’ so I’m whisked down somewhere with a
little bar open, ‘Yes, scotch,’ and back we come. But it’s typical of Arthur
Humphreys. The other sort of thing that Arthur Humphreys would do was that
supposing we were flying from West Palm Beach to New York and there were some
horny handed soils – like me and there were some directors going on the same flight,
he said, ‘Come and join us,’ he – he wouldn’t have us split into two lots, he thought it
was quite wrong that the boys should be separated from – from the bosses, so we all
went first class, and that sort of thing. But that made you love him and made you do
almost anything for him. However, he was a very hard taskmaster, very hard
taskmaster, he’d keep Peter Ellis and I working literally absolutely all night ‘cause –
till we were jolly nearly dropping, because he wanted a paper on the table next
morning for the meeting that was going to start at eight o’clock, that sort of thing. He
became managing director of ICL at the time it nearly went bank – it might have gone
broke, I’ve forgotten what it is, but anyway it was one of these crises like we’ve just
had and we’d got our net well and truly out, we had ordered fifty or 100 dirty great
files, revolving filing systems, I’m trying to think what they were called, for – for the
– either the 1908 or the 2900 range and the market dropped out, so all these were
ordered and were streaming in at 100,000 pounds a term – time and so he had to get
over that, so yeah. But a great man and I – I – I think of all the managing directors I
knew … the most charismatic was Basil de Ferranti but not by any mean – I think
Arthur Humphreys was undoubtedly the best, yes.

_Hmmm._

So that was about the 1300 – about the 1004 wasn’t it?

_Hmmm._
I think before that we were talking about transistors, I was just wondering why you adopted them?

For the obvious reason; they were cheap, small, you could get much more into a box, they didn’t give out masses of heat, yeah, and they – they had a high frequency performance, yes. I mean [laughs] if they were reliable and they were pre – the right price, there was no argument.

_Hmmm. So reliability was the key concern there?_

One of the reliab – price was the other.

_Hmmm. I’m interested in the fact you didn’t mention speed which is …_

Yes, I’m sorry I didn’t, yes.

_I’m not – I’m just – I’m just wondering if that –_

That’s very fair.

_If that wasn’t as important or –_

Very fair, no no, speed was important … I never heard of an argument about you can’t use transistors ‘cause they aren’t fast enough, no but I’m – I’m very vague on that so don’t press me on that, don’t press me on whether that came into the equation or not, but of course eventually transistors just roared ahead.

_But at the time –_

Faster and faster and faster they went.
At the time was – was speed the concern or was it the reliability part of it?

Speed in the business we were in was really not the – the – the challenge … in the very large machines yes it would have been, and near the death of ICL when they were signing up with Fujitsu … and this was not the field I was in but their speed was a point and we went to Fujitsu because they produced a very high speed central hunk that we called the box or something that we then built into our machines. But sorry, going back to speed, one of the machines I was involved with later on was that … by that time we had an American albino called Ed Mack as our boss, good chap and he’d got a cousin, or wife or something, who had got shares in a company in … Los Angeles that was connected with SRI, Stanford Research Institute … and the company was called Paylin, P-a-y-l-i-n and it was two directors, Max Paylie, an ex-IBM marketing pressure man, an image man, and Professor Flynn, an Irishman from – who thought the IRA were …

IRA?

IRA were super, but that’s beside the point … because they came shaking their money boxes around there and all the Americans duly put in their Irish brothers. So – but nice chaps, I got on very well with them indeed and in fact … they had put up a proposal for a very high speed central processor for a computer called an emulator. The object was, you built a central processor with a little tiny store which worked like the clappers of hell, possibly ten times faster than a bigger machine, and instead of having an instruction which was multiply or even add numbers, it would have a list of instructions far simpler that did very simple little operations, which – and you built up the bigger operations by effectively a subroutine of steps to do that. Multiply is often done by that as you – you imagine, add shift, add shift, test and so forth. So an emulator emulated an already existing list of functions that a particular range of computers might have, like the 1900 which had an order code, you know, add, subtract, multiply, what have you, and each of these were emulating on this machine by a set of sub programmes, but at a hell of a rate. So the overall machine could work fast and was very cheap because you only poured your money, your real money, into these very expensive computers, of which you had a few and an expensive store that you only had a few. Am I making sense?
Yes yes.

Good, okay [laughs]. So Paylin had proposed this emulator to us, I’m trying to remember the number but it got – it got … incorporated into the – the … 2900 range, a machine in the 2900 range was based on this and I think it was the 2903 but – on this emulator. But the real story is not to do with the emulator, it’s to do with the organisation behind that. So … Ed Mack, the boss of development in … BT – ICL by then I think, had agreed with Paylin that we would have this emulator and they would develop it for us. So I was the interface man, a long – I’m – almost fifteen, twenty years after my other computer operations was the liaison man [telephone ringing]. [Break in recording]. We get to – we got to Paylin and I was put – put in charge of the liaison, a spec was made out and a price and all that sort of thing and it was … they were paid so much on the development side and so – and also so much royalty on every time we put one of these boxes in a machine, say 100,000 pounds – and don’t put these figures down, but say 100,000 pounds development cost and then 1,000 pounds for each machine delivered or whatever it was. And I was – I’m sure it would have been bigger than that. But anyway, so … Flynn had his richest – sorry, wrong word, cleverest development engineers from his … I – I said what the name of the place – Stanford Research Institute working on this, so he had two or three highly skilled development engineers, electronic development engineers churning out the design and I went over there liaising with them. This all went excellently, we got the machine, it worked well, we put it – sold it out in the machine, I can’t – quite a number, 500 I think we sold with this emulator in, and Paylin duly got paid and so forth and to my great surprise after I’d parted with them for about a year they rang up and said, ‘We’re going to be in – in London,’ ‘Oh grand, how lovely,’ ‘We want you to come and see us,’ ‘Yes, sure.’ They said, ‘We’ve booked you a hotel – in a hotel,’ bloody good hotel, can’t remember which one it was and they gave me the most smashing dinner you could have had, it was absolutely lovely, it was a – it was a sort of thank you present which I thought was grand, I thought that was really lovely. So most blokes would have just forgotten it, and they didn’t want any more work, it was nothing like that, so they were –

Just – just being nice?
Yeah yeah.

*Hmmm.*

There it was, quite extraordinary, so that was good.

[48:36]

Out of interest the way things worked in there, I had a brilliant engineer working for me and he desperately wanted to emigrate to America, so … he was either going to emigrate with our without us, so we decided because he was bloody good that we would transfer him to Paylin and … that was the best thing to do, so he went to Paylin and worked on that. But his whole idea was to get to America so every evening he was out in the bars looking for a woman to marry and so stay in the States, which he succeeded in doing.

*[Laughs]*.

[49:19]

*I’m aware that in the chapter of your career today you’ve gone from being a development engineer to being a manager.*

Yeah.

*I was wondering if we could just finish off today you reflecting a little bit on that change? What is your life like as a manager compared to a development engineer?*

Let’s put it this way, I think it was inevitable and it was a tragedy, in other words, when I got about past thirty, my inventive ability ceased, and I’ve heard other people say this, I don’t mean managing other people’s ideas, actually having new ideas yourself. And also being a manager I got paid more, but I wasn’t a good manager as I was a good development engineer, I was not good at controlling a team of men, no,
was not – not my strong point. So many of my managerial jobs were one offs in a way where they wanted a – a knowledgeable reliable cerebral chap to … spearhead some sort of individual effort, like Paylin sorting that out, yeah. But of course you’d never get anywhere in the organisation doing that, because having done that, you come back; what the hell are we going to do with this bloke? There’s no natural progression up the chain, no. I mean yes I was paid and I – I was reasonably happy and I then became at one time so called chief engineer, but since we didn’t do any bloody engineering it wasn’t much of a post, that’s a bit of a – an understatement but anyway, the answer is no, from there onwards it was – it was marking time, going on a – on a level, not going up the management tree, no. And in fact in ICL very few engineers got up the management tree, most fell off for various reasons on the way up, because the business changed, hardware development became nil in the end, everything was brought in and so systems engineers became what the company needed and the – I – Fujitsu, UK Fujitsu now take on that sort of contract all the time, like put in a contract for the Ministry of X Y Z to do so and so and they shop around for the bits and they shop around for the programmes, or develop the programmes that the engineers developing a computer to solve a problem is … is finished as far as the – the – well I think so as the computer manufacturers are concerned. Mind you, there may be somebody out in Japan doing this, who knows.

[Laughs].

But he’d be on a chip anyway.

Hmmm.

[52:20]

So just let me get your – your managerial career and – ‘cause you’ve mentioned a few sort of different positions along the way and I’m just sort of trying to put it in order.

I don’t think I can remember [both laugh]. We’d have to work it out.

Yeah, ‘cause you mentioned being a department head.
Yes, well that when I did have some power, but there again I was a manager, I was evolving specifications for developing new peripherals and devices to add onto machines, yes.

*So just – just give me an idea –*

That was the 1301, yes.

*That was the 1301 period.*

Then I was in planning. And then I went over to America with … on the Poplar business and – with Peter Ellis and the start of the 1900 series. And then – what we haven’t said is, then I left planning division entirely and went to work for ECHO Organ as his data processing manager, because data processing was very important in production control, vast factories with all the bits that had got to be there and that sort of thing. And they – they got up to that point a vast punch card installation. What happened was that … with tabulators, punch card equipment, vaster number of piece parts, all different, little bits of swidges and wops [interviewee meant nuts and bolts] and screws and washers and lever arms and cables … so the piece parts were huge in number. Also as I said almost every tabulator ordered was different, so it had a different list of parts that were necessary for that. So a very complicated production control system was put in place to … break down the components needed to meet the particular production period, say a month, twenty-seven of those, these specials, so forth, all the bits like this which used cross parts like nuts, screws, bolts, relays and what have you, and find out all the bits that you needed below this, and then print out orders with – now each component had to go through a series of manufacturing processes; blanking out, polishing, drilling, tempering and all these sort of things, all of which took a different time, so the – those orders had to be printed and loaded on the factory at the right time. Production control, very very complicated indeed and masses of little bits. And it kept on breaking down and it was – and then we had to keep on doing it by hand and, oh, it was miserable. So – but then electronics came along and electronic individual components usually are worth next to nothing, you buy a – a bin of resistors, you don’t want to know the 2,572 in there at a halfpenny
each, you just ignore the individual cost of those things, our mass, yes you need to know the cost, but – so you don’t have to order three for that and five for that, so when it went into electronic production, there were a number of bins that you had to keep full, effectively, and you used your brain as to what was likely to – to put the load on these things, but when the leveller stop went down in a bin you ordered some more, so quite quite different from the old method of – of ordering for relay production and what have you, so production control changed immensely. So I was in that period of getting electronic production control into what had been an electromechanical machine working factory. Of course the machine shops in Hollerith went through a terrible time, apart from one time in Northern Ireland we have a factory that was a third of a mile long with machines, chug chug chug, all that went, same went in this country, all the lathe operators, the drillers got reduced to about a tenth of its size, it was substituted by other people that did things like … assembling racks and covers for computers, assembling power supplies, that sort of thing, so the – there was a changeover, but the – the mechanical engineering with the – the precision, beautiful precision engineering of making high precision assemblies disappeared, quite – I can’t think we had any. We didn’t make the printers, we didn’t make the mag tape decks, they were all made out. Card readers yes we made. Yes we did still make printers but they were the old style of slower printers and they had been card punches we’d made, yes. But even that started to fade out because the other methods of putting information into computers came along, was superseded by – I’ll think of them in a minute, but there were various – a whole range of machines that superseded the punch card.

_Hmmm._

History of the computer business with true variations perhaps, I don’t know [both laugh], anyway.

_Shall we wrap up?_

Yes please.

[End of Track 12]
Track 13

Right.

This is an interview with Ray Bird, second of July 2010.

When the ICT planning division, or it might have been ICL, I –

You’ve buried your mike again when you moved [laughs]. Shall I move it somewhere else actually, I’ll just pop – [break in recording] –

CDL staff at Bracknell moved up to London to become the company planning division, I moved to Letchworth to work for ECHO Organ, ECHO Organ as his data processing manager because he had not got a … sufficiently professional data processing installation. The main job of the data processing in Letchworth Stevenage ICL was production control, support of the factory, so a whole raft of software which would eventually be offered to ICL customers was produced to … over – manage production control. This consisted of taking the programme of devices to be manufacturing, which since this included tabulators which were still going strong, there were masses of small items to be ordered, counters, relays, what have you, also the computers were in there so that the programme which you want these machines by this date was fed into this machine and then there was the … parts lists, what parts each item on the programme consisted of, many of these parts were common amongst various devices, so there was a – a great programme that took the programme, got the items out of the – of the list of parts needed to make those programmes and integrated to how much you have to make what parts by when in order to achieve the production dates on – on the programme. This was particularly … controlled by the need for the punch card production team, masses of mechanical devices; shafts, gears, what have you, and electrical devices, relays and plugs and sockets and wire and so forth. When the computers came along and they were superseding the punch card equipment, most of the computer parts were of very low value; a resistor, a capacitor and so forth, a switch, a piece of wire, in the pence region. So – and most of them were bought out anyway, so the whole method of controlling stock control altered from making lots of mechanical bits, to ordering in lots of individual electrical bits, and because those
electrical bits were not of very high value you could buy in six months worth, a years
worth, put it in the bin, you didn’t have to phase the – the production or acquisition of
those little bits week by week or month by month. So that worked excellently. We
produced a new computer room at Stevenage with one of the nice new 1900
ccomputers in it with a viewing gallery and customers came and gawped, and that
worked reasonably well, so that was my main reason of existing in ICL Stevenage
Letchworth … ICL’s software division which was based at Reading was due for a – to
a great expansion because of compilers, those sort of things were being evolved at that
time [Closed between 04:14 - 05:18] I’m now posted to Reading where a bit new
software … factory, eleven storeys, was being erected at Bracknell to take all the
software people, and at least 1,000 people were in that and I was unfortunately
appointed as the administration manager which meant I had no technical contact
hardly at all, though I did have a minor technical contact in that I controlled the
purchase and planning and that sort of thing of mechanical devices, so – but on the
whole I was just an admin manager. Then … there was a great revolution in ICL
when an American manager, Geoff Cross was brought in to try and shake the
company up, which he succeeded in doing, whether the – the way the dice fell was
sensible is anybody’s guess but … he brought in a lot of hard American managers to
manage the company and they were spread across the development organisation and
the marketing organisation. I then became so called chief engineer which was – since
there was very little engineering done at Stevenage anyway was not – not a very
onerous task. I was chief engineer of ICL South, because there was another similar
chief engineer in what had been the ex-Ferranti and English Electric part in the north.
I became reporting to a very good manager called Don Neely and he had a team that
started to develop the System Ten which was a copy of the Singer machine which was
highly successful but incompatible with nothing – or anything I should have said
[laughs]. So therefore there was a great row in the company since we’d got the 1900
and were going to have the 2900 which was from cradle to grave, you know, bottom
to top, whereas the System Ten was entirely different machine, but it was reliable, it
was hardworking, it was cheap, it was easy to install and it succeeded, and a large
number of them were built and there was a reengineered version produced at
Stevenage and so I had some input being chief engineer on that. So then came the
time when I got to sixty and I was offered and took early retirement. Offered let me
say with a gun in their hands, in other words, you know, I think you better go like, so
that was all right, no real argument. So I retired at sixty and … one of my jobs before I retired in … Stevenage, sorry beg your pardon, Bracknell, was to introduce to the company BS5750 which is the quality standard and that implies a whole list of facilities that must be available to a company and they’re then audited by the British Standards Institute to see if they’re up to standard and if so they get the – the kite mark for BS5750 and stick it all over their products. That then evolved into ISO9000 which was the same thing evolved – idea evolved into being an international standard and I helped introduce that … firstly working for BSI, British Standards Institute as an auditor, since they were more interested in blowing up boilers and things like that and not into highly complex computers, so in order to get a number of auditors of sufficient quality I was employed by them to audit companies for 5750. And that was an extremely interesting activity, very very interesting, since it – it meant that one went into companies at the first rank and could look at absolutely everything, except the financial books, but you could – everything else, and you had to have a view on it, so I audited IBM, Burrows and various others worldwide electronic and computer companies, which was excellent and very stimulating. Then I left that, left BSI and became a self-employed consultant helping people get up to steam to sit BS5750. This scheme was run by – I can’t remember it, but it was a government scheme run by a production control organisation, I am sorry I can’t remember the name of the government people that were running this, I did that very successfully for about five years and … employed a couple of chaps to help me do this, the scheme was – after you’ve done one or two it – it became turn a handle and out it came and it was successful and yes I did help a – a large number of firms get – get certified. And then eventually at the time my wife died, which was in 1971, I decided – and I was then – where was I, well, if I – if it was – I was born in 1923 so … oh dear oh dear … and I was seventy-one, seventy-one and twenty-three, ninety-four does that make?

Yeah, ninety-four.

… Yes, so about ’94 I retired and became a man of leisure. So there we are. Anything else you’d like me to say on all this little lot?

That’s – no, you know, the – they were four very interesting sounding jobs there. Can we take them one by one?
If you like, I would not necessarily use the word interesting but nevertheless.

What’s a data processing manager actually do?

Runs a system of programmers – well systems analysts to start with and programmers who produce systems specific to that – the part of – well the customer which happened to be in production or development of the organisation within ICL, so you provided the computer service to the development and manufacturing side of ICL. Hmmm … production control as I say was our main one, payroll of course was another one, certain development routines to help the developments side were done. And an interesting one was ECHO Organ was very supportive of computer controlled machine tools, very elaborate machines that had a – a programme inside which would select the right tools and the right dimensions and the right position for the piece to be manufactured and carve out of the solid some very elaborate piece of – of iron. That needed a special programme to control it, very strongly did as you can imagine, ‘cause you can produce scrap quicker than anything else. So that was another programme I produced. And the name of the programme was Milmap, M-i-l-m-a-p. And also programmes for … the production of printed circuit boards from taking the – the circuit diagram and placing the wires and the elements on the board, so that when you made the board that it joined up correctly, so this board usually had two sides by – two sides with holes through for connecting, but – but this method of production control of the boards eventually it was cheaper and better to do it by buying in an already evolved system by mostly American companies that – that had already done it. So one find – one found oneself pedalling like hell and at far more cost to produce something that could be got off the shelf from – from a supplier. So that was good. So you said what else did they do, ran – of course a data processing installation also ran the computer itself, which had a – a basic load which had to be done regularly, usually payroll and stock control and of course was used as a tool for the evolution of all these other systems I’ve been talking about.

[15:45]
During the period I was data processing manager there was – was one interesting thing, there was a fire in the Letchworth data – sorry, data processing installation in the factory at Letchworth, this happened on a very very hot Sunday and … the fire was not actually in the computer room, but it was in the – the offices at the – that did the programming and serviced it, but next door to the computer rooms, and the fumes from the fire which had – were very acidic because a lot of it was due to burning PVC on wires, the hydrochloric acid vapour in this corroded everything in sight. When I tore over to – to Letchworth when I was phoned at this fire there, and I looked at the computer and various other things in the computer room next door, they looked perfectly all right, they looked absolutely – and I said, ‘Thank goodness they’re all right,’ come the morning when the humidity had got in, corrosion had started immediately, so it – it – the hydraulic – hydrochloric acid needed some moisture to get going, so effectively we had to scrap the computer, which wasn’t that serious because we made computers, so the production control manager, the factory manager Jack Saville very naturally said, ‘You’ll have one tomorrow morning Dick,’ and we did, you know, and it was going again. Now then the next thing was the magnetic tapes, the – which were vital of course with all the things like – so we had a magnetic tape store with these rows and rows of reels of magnetic tape in and the heat from that made the reels that held the magnetic tape, the – the twelve inch diameter reels shrink to squeeze the magnetic tape on it, and so again panicked, what the hell are we going to do? So we carefully took the reels of magnetic tape and cut away the old shrinking spool that was round them, rewound it and they worked perfectly, so quite frankly the fire which was tremendous, as far as disrupting production, not one iota did we – not one beat did we use. I mean it cost a lot of money and a great deal of hassle … one of the big bits of hassle naturally were the insurers were round next morning, you know, and how the hell could this happen and what’s our rates and so forth and so forth. But anyway, we managed to get round that all right.

Hmmm.

[18:43]

So that’s – that’s that.
Could you actually describe the computer facilities that you had there?

Yes certainly. It was a typical computer installation, nothing special. There would be an area where the programmers sat on their desks and produced their routines, got them – got them typed up for testing and running through the machine, and then there was an operational side where the operators who were running the machine, plus usually the girls who prog – programmed [laughs] – scheduled what was to be run when and got the tapes out ready and the paper out ready for printing on and – and prepared the job, and there would be a job schedule with would run on the machine, day and night incidentally, this all ran day and night … to give the output to the customers, things became absolutely routine on payroll in particular, they had to be produced and was produced regularly for its output, yes. So I suppose I had twenty-five, thirty people programming and supporting that machine on the production side at Letchworth.

What sorts of people?

What sort of people? They [both talking at once] started – oh men and women, they started off by being punch card people who gravitated across to the computer, but then when computers became more widespread we would either hire in already trained computer operators, or we would have a … an apprentice scheme whereby lads could be a data processing apprentice and work their way up. It worked satisfactorily, yes. Next.

Who was your boss in this period?

The boss in this period was the administrator of … ECHO Organ’s empire, which was the development and the manufacturing empire, very nice chap, I got on excellently with him, he just said, ‘Get on with it,’ and no problem at all, yes. And also ECHO Organ was a – very much an old fashioned type manager who was a personality manager to his fingertips, he chose people that he thought would do the job and supported them to the hilt, wasn’t technically very high powered and the – we also were very – what’s the word I want, old fashioned in that there was a we and they amongst the – the managers and the dividing line was whether or not you were
allowed into the management dining room to eat your meals, where ECHO was of course and that was the – the fountain of all knowledge. So I was a blue eyed boy because I’d known ECHO for many years way back to the CDL days, and he – he liked people he could – he could trust and get on with. It was a rather drunken time, whether after lunch one was as efficient as one was before lunch was anybody’s guess. But excellent and grand. Now when the Americans came in they scrubbed all that and everybody ate in the same place and so forth, whether that was efficient I don’t know.

_Hmmm. So you were allowed in the management dining room?_

Oh yes, very much so, oh very much so. Yeah.

_Could you describe the dining room to me?_

No – well yes, seat about twenty people, a small little serving – two dedicated waitresses who – who served you, yes, and … there was usually a choice … yes, rather like a – a good restaurant, yes. A lot of booze, any booze you wanted, which you paid for incidentally, yes.

_What sort of conversations does one have over lunch in the managers’ room?_

Oh dear oh dear [laughs]. On the whole work was not discussed, no. Yes it was if necessary but on the whole not really, only when somebody wanted somebody to clarify something they would get this. I honestly can’t remember the details of the conversations, no, no. As – as any group of men would I would think, yes. Nothing particularly … also of course there were guests that came in, either from head office or from … the – local guests might come in such as the – the police chief of the town might come in, because we were a big employer and therefore people came, that sort of thing …

[23:40]
It was also – and I should have said this earlier, an important place for entertaining customers that came to look round the works and hopefully buy a machine, so I should think three days out of five there would be customers with a salesman in – in a – in [inaud] them, being introduced to ECHO and – and the manufacturers, to the manufacturing staff and the development staff. So yes, so it was a – a sales outlet, yes.

Did you have to be on best behaviour when customers were around or –

Depended on the customer, because many of these customers had probably been known to the company for years, some weren’t of course but – and you took your cue from the marketing man who was escorting these people round and into the dining room, and if he’d any sense he’d been on the phone the day before saying, ‘I’m bringing – Bill Bloggs is coming in, I want you to stress this but not stress this,’ you know, that sort of thing, yes yes, as you would expect. Nothing abnormal there [laughs].

Well you know, it’s another world for me [both laugh]. What sort of customers would come –

Well I’m just thinking of one out of interest because it – it had a – a sad outcome. He was a … glass maker from Sweden and I think the glass he made was called Orrefors glass, very famous glass, beautiful crystal glass, and as a thank you for all this thing he – he gave each of us an – a very lovely prism made of this glass, which obviously when it caught the light right you got a multitude of colours out of it and I took this – my particular piece back to my office and put it on my table and regrettably next morning it had gone and I never saw it again. So theft was very very rare, very rare indeed but it did happen in this case. So that’s why I remember that chap. Also he was stone paralytic but then he – often the Swedes and the – the Norwegians are.

[26:01]

Sounds like quite a hard drinking culture at ICL?
Yes it was indeed, it was indeed, was it a good idea, looking back no it wasn’t, but it was a hard drinking culture, very much so, very very much so. And often the hard drinking went on after work, particularly driven by ECHO Organ, he’d say, ‘Dick, we’re going down the so and so tonight, want to come?’ I said, ‘Well actually I’ve got to …’ ‘You’re coming,’ you know, it’s that sort of thing, so the – the three line whip you had to – to go if – if the boss whistled, yes. He was a – he was a tyrant but also an extremely able manager of men I think in – personality wise, yes, very encouraging, very – that sort of thing. Did the stuff we develop work very well, no [laughs]. So there we are.

_Hmmm._

So, withdraw that last statement, yes it did work very well, the computers worked well and sold well and went into there … certain other things didn’t work very well but that did, I can’t remember what they were but it – that did happen, yeah.

[27:17]

_I noticed you were – mentioned you were called Dick a moment ago –_

_Hmmm, Dickie Bird, yes I’m Dickie Bird, yes._

_You know, when did you actually acquire that nickname?_

When I was born I suppose [laughs]. Next.

_I’ve always associated it with the umpire but –_

Oh that – was it after or before that time [both talking at once], he was after that time when I was first called Dickie Bird, yes, but any child is – who’s a bird is Dickie Bird, you know, just can’t do anything about it, there you are, you better live with it.

_[Laughs]._
Yes.

Is that what your parents called you as well or was it just –

No, they called me Ray, that’s right, Ray yeah.

Hmmm.

[27:55]

I was just wondering you – you mentioned when you were describing your career at the start of this interview this viewing gallery in your computer room.

Yes.

And I just wondered what you meant by that [laughs]?

Exactly that, the – the computer room is air conditioned and you don’t want – because of what’s going on there, people walking around it while people are shuffling magnetic tapes around and you drop it on the floor and that’s you, yeah, can’t have it, it’s got to be sealed off and run professionally. But the object of the computer room was firstly to produce the work, but secondly to be visible to customers, so they could see what a good installation looked like in the factory and that we’re actually using our own machines to control the production, which was the vital point. So the viewing gallery, there was a glass side to the three – to the four sided room and that glass side had a series of perhaps three or four steps up to a long platform, so you were raised up and could look down slightly at the computer and the girls doing the job and loading the machines and paper and mag tape and all the rest of the things, yeah.

Hmmm. Did you get visitors coming through and looking into this thing as well or –

No, that’s what I – that’s what it’s for. The viewing – viewing gallery was precisely for visitors, no other reason whatsoever, it was built there for publicity purposes, yes.
Hmmm.

[29:26]

You mentioned a few different sort of computing jobs that this – your service provided.

Yeah.

Which were the most important?

Oh what to say? Well I suppose first of all production and control ‘cause if you didn’t control the production then there wasn’t any money, and then having done that you’ve got to pay the people, so payroll was jolly important, so those are the two most important jobs I think.

Are you developing this software yourself or are you just buying from someone else or –

No, I think I did mention earlier that we were developing special software for production control and for – production control was a series of programmes called PROMPT, P-R-O-M-P-T, which the customer could mix and match according to what he wanted to do, so it was a selling tool and we used it of course in our own production. Payroll routine was produced by the company, so some programmers in London, in the head office London computer service, produced the payroll programme that we ran. Other routines like invoicing we also produced and so forth, yeah.

Hmmm.

[30:47]

You mentioned that there was this production control – schedule for the computing.
Yeah.

Did it have any sort of after hours unofficial uses as well, or was everything by the book?

On the whole there wasn’t much … irregular use of the computer for anything else, no. No, I can’t honestly think of any case where that happened. Certainly in my term – time there was never any, what I might call financially involved illegal operation of the machine, where either somebody was surreptitiously selling some machine time to do – that never happened as far as I know. Also of course payroll and things like that had to have strict controls on them … but the operator had no idea, say on payroll what was happening, yes on the output a great stream of payslips would come out of course which would then go to a back office where somebody would chop them up and put them in packets and whatever happened to them, but illicit use of the computer, not that I can think of.

Hmmm, did that happen elsewhere, the way you said it was –

Oh yes yes yes, I’ve heard about it, yes, if you look in the press I’m sure you’d find things where people have misused the computers. Particularly people wanting information from the files, oh what’s the word I want? There’s a phrase for it where people steal information.

Hacking?

It’s not called hacking yes, but this really wasn’t hacking at that – that – in that way. For instance, in America definitely no, but in a big company … Japanese staff stole development output from developing a new machine and shipped it off to a Japanese company, that – you’ll find that in the – in the records. Out of interest the – the chap that blew the whistle on that and said, you know, ‘This is happening and so forth, we mustn’t do that,’ everybody patted him on the back but he couldn’t get a job after that, so being a whistleblower is not necessarily a good thing in the long run. So that was that. Now let me just think about computer crime and that sort of thing … we
certainly didn’t have any as far as I can remember … but of course there’s a whole lot of information that would be extremely valuable to competitors, list of customers for a start, so computer rooms were strictly controlled, but as far as I know – of course you never do know whether any of it’s – did leak out.

_Hmmm. So was sort of data protection, data security a day to day problem or worry for you?

_Not one of my greatest worries because it – it didn’t happen, thank god. Well probably the system we had in was adequate. I think that such theft would be much more likely in the marketing side of ICL up in London where the files of our customers were kept, which would be much more interesting to our competitors.

_Hmmm. Do you remember what measures you actually put in place for data security?

No.

_Hmmm._

_[35:04]_

_What’s actually a working day like for you in this period? What was –_

Fairly – not very stressful, no. Come into work at nine o’clock in the morning, nice office, head – head office – nice headquarters block office, in fact next to the boss which was not necessarily a good thing, which was purely fortuitous, it wasn’t there was any need for me to be next door to the boss. Secretary, look at the post, go and visit my programmers, see and what they were doing, check on timescales of developments or what have you. Above all look at the timescale for the actual production of the routines that had to be – to be shipped out. So during that time of my work no trouble at all.

_Hmmm, sounds like a normal nine to five job or –_
Yes, yes. Plus the – the extra boozing time on the end of that.

[Laughs] Hmm.

[36:07]

What does a data manager actually worry about?

… Data processing is like manufacturing; something has to come out of the door to a timescale to satisfy the customer and all the routines had to come out right and on time, yeah, yeah.

Hmmm. How – are there any ways you can ensure that happens? Any tricks of the trade or –

Good management I suppose, I can’t really think of anything specific.

Hmmm.

[36:42]

Are there any other sort of management style things you have to do like hiring staff or …?

… Yes, of course you had to hire staff, you would advertise for staff, both internally and externally, you would interview them according to what have you, yeah yeah. No I – nothing abnormal, I can’t think of anything that would be unusual today.

Hmmm, you’re forgetting, I’ve never been a manager so I don’t know what’s usual [both laugh] and what’s unusual, I’m trying to find out what’s in there all together, it’s – hmmm, what do you look for in good staff as the manager of a data processing installation, what are you looking for?
Well the usual things like honesty and integrity … depends what the – the person was being used for, whether they were a day to day operator, or whether they also controlled a team and were a manager in their own right. We’ve leave it at that, I can’t really think of much more. We’re flogging a dead horse if you understand me. [both laugh]

*Did you expect your staff to behave in a particular way or was –*

Not particularly, no, they were just another lot as staff as there were others round them, hundreds, yes.

*Hmmmm.*

[38:22].

*What was your social life like at this time, apart from the drinking in the pubs [laughs] with the boss?*

Well my social life was mostly – nothing to do with the company at all, it was – because I – I had a wife and children and lived in a nice village, an hour’s drive away, so quite quite quite separate. The social side in our village, which was a little village called Little Gaddesden, was very interesting because the village was … what’s the word I want, it was a very affluent village on the edge of the Ashridge Estate and had a lot of interesting people in it and a good social life, like what do you call it, amateur dramatics which I belonged to, and so forth and had a pony for a bit and we had … a nice piece of ground, a nice acre garden which had to be … looked after. Dogs, bees, so yes the – the – had a very rich and happy social life in the village of Little Gaddesden, yes.

*Hmmmm. You mentioned amateur dramatics.*

Hmmmm … again we were blessed with a number of people who’d been associated with – or were still associated with the theatrical world in various ways who helped in various ways. I mean Shakespeare was produced on a regular basis, various other
plays, my wife produced one which I think was the Summer of the Seventeenth Doll, which is – is about … north Australians cane cutters. I acted very minor roles, yes it was fun, yes. That was that. There we are.

*How old were your children by this point?*

My children – my … I suppose children were something like sixteen, fourteen and twelve, that sort of age. Yeah, but the – nothing to do with my work side, they were quite quite quite quite separate, yeah.

*I was just thinking, because you mentioned your children being born – or your first child being born a few interviews ago and I was just wondering where the other two came into this along the way. [both laugh]*

We had three, Andrew the eldest, Sarah the middle one and Linda the youngest. That’s Linda the bottom one there on – on – who’s now in Afghanistan, god help her, there we are. So [pause] bollocks, that is – forget that, that’s a grandchild, not a child. That is Diana, could well be Linda actually but it isn’t.

*[Laughs].*

And my children all married happily and are still happily married and have each produced three – three offspring, so not bad, so they’re happy, so good. Like that – the top one there with all the children on there.

*What do your children actually do?*

My children, well they’re … Andrew is now retired, he … was in the data processing business and became managing director of a couple of small companies, engineering in various ways. Sarah, housewife, brought up children and then recently has gone out to work again, firstly as a hospital – sorry, a doctor’s receptionist and – and then moved onto secretary to … a small company that did audits for – is it the Health and Safety at Work Act whereby you have to provide access for disabled people, so she had the job of going around country churches in the middle of fields in the middle of
nowhere looking at how disabled people could get in and out. Typical example of the health and safety gone absolutely mad, absurd and the money wasted on all this audits, ‘cause she got paid for it of course, about time we had a – a clamp down on the … the social services, crazy. Anyway, there we were.

*I'll just pop that door shut, there's the background noise.*

Yeah, sure … [shutting door] good. So that – that’s Sarah, now she’s employed in the … tourist industry backroom selling tours to here there and everywhere else. And Linda married to … a very successful … what do you call it, accountant, big accountancy firm in London who’s recently retired, she – after producing five lovely children – sorry three lovely children, is now very interested in golf so they have golf holidays all over the place. So yes it’s all – the three children have – have … worked out extremely well and that’s right, and glad to say all the grandchildren get on well with each other and it’s excellent so far. Something will go wrong but at the moment everything’s all right [both laugh]. Such as that one getting killed in Afghanistan, I should think that’s probably the most thing – most worrying thing.

*Hmmm.*

Right, what next?

*I was just wondering, you know, what did you actually want for your children when they were growing up about this time? Did you have any sort of plans in mind for them or …?*

… Interesting question because … in no way did we plan the career of any of our children, they found their own way in the world and did it reasonably successfully, yes. Yes yes.

*Just thinking there are sort of parallels with your own career there, you know, some data processing and stuff.*
Well Andrew has definitely got an engineering bent, just as I have, and he’s always building things and that sort of thing. So yes – and he went into data processing. Ah, why did he go into data processing, because – I was wrong, he didn’t do too well at school so he didn’t go to university, so what he did – at that time what he did was … ICL had an engineering apprenticeship scheme and he – he became an ICL apprentice engineer, very good apprenticeship it was too. And then he went onto the marketing side and programming side where he met his wife in ICL, and so that was grand and then he started to sell ICL computers and then moved off onto other things and … excellent, yes.

_Hmmm, interesting you – you both end up working in the same company, is that the same time period or had you retired by this point?_  

Yes, yes they were but it’s a huge company and I didn’t see any – they moved off to do their things, so there was no interaction on that side, no.

_Hmmm._

[46:12]

_How did you actually become a data processing manager in the first place, it seems quite different to your [both laugh] – your original –_

Well for the obvious reason that I developed computers and when, as I was saying, I was working for CDL and they then became ICT’s planning division and I wanted – they wanted me to move to the head office in London, which I didn’t want to go ‘cause I was a country lad and journey would have just – I said to ECHO Organ, ‘Have you got a job for me?’ and he said, ‘Yes, come and be my data processing manager,’ so that’s how – that’s how and it worked out extremely well.

_Did you enjoy being a data processing manager?_  

… Was it greatly stimulating, no, but it was tolerable yes, tolerable, yes yes.
Hmmm.

[47:01]

And how did you move from being in data processing to working at Reading?

… From data processing into making …?

To – to working with ICL software at Reading?

Oh I’m sorry, again this chap called Mike Forest who was the boss of the programming organisation said to ECHO Organ, ‘I want an administration manager,’ and ECHO said, ‘Dick, that’s your job, off you go,’ so I – you know, that – that’s how that happened again. Was that a good idea? No, in – it – it was not a good career step but there we are, no. You know, I’d known him for many – ECHO Organ for many years and he said, ‘Dick I want you to go as administration manager,’ so I went, you know. Right.

Hmmm. What was ICL software in Reading actually like, what sort of building is it in?

It got bigger and bigger and bigger, again with a … it was prod – just as I had been producing routines for production control and those sort of things, as the computer world moved forward, things like operating systems became – and compilers became huge technical development activities and that’s what the vast computer division was doing, writing compilers and development things and so forth, yes. But I was not involved in that in any way, no.

So what did your work at Reading actually involve, what does an administrative –

Well exactly what it says, keeping the building running and all the things associated with it, yeah. Yeah, a huge building, thousand people in it, all a multitude of things that have to go on to keep that thing working, you know, transport, cleaning, catering, the – the fabric of the building, security, yeah, all those things, typing pools, social
side, to keep that going, there was a bar and that had to be serviced and kept going and so on, and liaison with the outside world as far as the local town was concerned, ‘cause we employed 1,000 people and buses had to come and police had to be there and things would get stolen and, you know, just as a thought, you know, not often but they did occasionally.

_Hmmm. Liaison with the local town, what does that actually involve?_

Very little, very little, but particularly the police because we had a – I had a security service with twenty-four hours a day blokes working on – on the gate and on that sort of thing, make sure everything was right, and when we employed staff on the security side in particular we would often take the advice of the local police blokes, what they thought, say, ‘Oh well, no, no …’ you know, ‘rough area, I wouldn’t if I were you,’ and so forth. They used to – ah, and the other thing is of course we had a good – good restaurant, canteen, so they liked coming in for a meal which we encouraged because it – it – oh and then of course the – the never-ending continual battle with the GPO on telephones and – which was vital for us, absolutely vital of course. The GPO gave us a very poor service and we had to … keep fighting them. And now what are – else about it, oh an interesting thing was that of course the electricity consumption of this tower block with the vast computer room down below was ginormous. The … computer … building, the power that came into that through the huge thick cables was very high indeed and we had one terrible time when the actual mains connection of these thick wires burnt out, and this was on a Saturday and – and so it was thirty-six hours of hell finding a – a contractor that came from nowhere in Essex somewhere with these lads and I said to the chap that found them, ‘How do I keep these chaps happy?’ he said, ‘Get a crate of scotch,’ and so [laughs] it was that sort of business, and thirty-six hours of hell but they got it all sorted out and soldered on again and it went again. So that was that. But all sorts of interface things like telephones, electrics, post, the outside world in general which – which caused us trouble. Again this was a time of the three day week when there was a great row with the unions and, I’m trying to think of the actual date for this but it – I think it was Maggie Thatcher’s time some time wasn’t it?

_Three day week? No, that’s ’73, ’74-ish I think._
Oh well, you’d know better than I do.

_I could be wrong._

I could be, you’re much more likely to be right than I – I am.

_I don’t know, I wasn’t there [both laugh] so –_

Oh dear dear dear.

_Hmmm._

… In order to safeguard the running of the computer installation and the heating of the building and all that sort of thing, during this time I had to buy a … a tank for fuel as a standby and of course everybody wanted tanks for fuel and I remember going and looking at this retched rotting tank somewhere down in the estuary, London and – to buy this tank, I’d got no way of testing how thick the walls were with the rust and that sort of thing, and so we bought this tank and installed it and built – had to build a bund round it so that if it leaked you contained the – the fuel, but it – it worked all right and when this was all over we tried to sell it [laughs] but nobody wanted to [inaud] so that was that. But anyway, that’s a typical sort of thing you have to do.

_Hmmm, sounds a lot like all these jobs are basically connected with keeping the rest of the facility going?_

That’s right, as I say administration of the – of the lot, that’s right.

_Hmmm._

And then the building was always changing all the time, bits added on, trying to grow so we had a whole lot of portacabins out the back had to be supplied with electricity and light and all that sort of thing as you can well imagine, loos had to be built to service the extra people coming in.
Though computer installation changed amazingly during that time, when I started there was huge computers churning the stuff out and then the world sort of changed and people went to PCs and that sort of thing, so this vast computer hall became redundant and much smaller machines were – were needed in it. Yeah.

*Hmmm. What – when did the PCs come into this?*

I’m – I’m so sorry, I can’t date that for you.

*I’m sort of thinking is it late ‘70s or early ‘80s [laughs]?*

No, without a lot of homework – as I say my mind goes blank on that sort of thing.

*It’s interesting the thing you were saying about the GPO and the problems with them, are these sort of just normal telephone lines or leased lines or –*

Yes, telephone lines. ‘Cause we always wanted more or different or whatever happened and they’d break down and then nobody would put them right and so forth. And they were very unionised and not supportive, and one of the things I had to try and do was to get dedicated GPO mechanics for our job, rather than have to timeshare with all sorts of other people having demands on their time, which eventually persuaded the GPO was a good idea ‘cause look at the bill, you know, huge.

*Hmmm.*

*Did you have many problems with the union in this time? Were they –*
On the whole no. Since we were a development organisation and most development people don’t want to belong to a bloody union, no way do they want – they want to be unionised, not their – their sort of thinking. As far as I can recall we had no – no union trouble at all. That’s in this particular area of the company, other areas of the company with – with vast mech – manufacturing areas, oh quite different I suspect, they would have had union troubles, yeah.

_Hmm, are there any unions for computer operators?_

Yes … [laughs].

_I didn’t know that [laughs]._

[Laughs] Yes. I – I cannot remember the name of the union or what it did, no.

_Hmm._

But computer – computer operators on the whole … for some reason were – were continually changing. I think they were young lads who moved onto something else.

_Hmm._

[57:02]

_As a manager were you mainly socialising with other managers or with your lower staff as well?_

Because I lived a long way away there was very little socialising with the people who I worked with. The socialising I did was mostly at lunchtime having a drink with somebody and had a – yes, a nice small coterie of chaps who used to go and – and drink with, yes, they were friends, yeah. And they were – they were managers of various things, yeah.

_Is there anyone you remember in particular or …?_
Not particularly, no, no.

*But mainly other managers then or –*

Yes yes.

*Hmmm.*

[57:45]

*You mentioned that ICL was changing as a culture about this time with the Americans coming in?*

I’m not really fit to – to talk about why this was and how it happened, but ICL went through a series of management revolutions and changes. There’s a bloke called Geoff Wilmot I remember who was a very dynamic managing director. And then I think the board got fed up of – of ICL managers and felt the Americans seemed to be able to run their companies all right. Did she hurt you?

*No.*

Oh, I thought she did. So this chap called Geoff Cross was brought in, a high powered American manager who was – also brought in a chap called Ed Mack who became development manager, superseding E.C.H. Organ and they hired possibly ten or fifteen ‘high powered’ American managers to come in and support and drive various bits of the manufacturing process, development process. Some were good, some were bad. They were offered the earth to come and work over here and, well, that’s about all that could be said, they all went home with their bags of loot when they – their contracts were over, yes.

*What sort of difference did that make for you as a – a manager?*
Very little – very little, yes, very little. No, no comment, no, they got on with the job as it had to be done … their attitude to company money was quite different, they were – they would waste money and spend money excessively, for instance – but they had to be treated with kid gloves because they were – we’d paid a lot of money for them and we needed them, so we thought. For instance, one of them used to wreck motorcars at a fantastic rate which, yeah, ‘Give him another one,’ sort of, you know.

*Hmmm.* *Did you have much contact with him yourself?*

As little as possible, little as possible, yes. Oh he’s probably all right, nice chaps, but no, not my – not my cup of tea, no. They – they were hard, not very knowledgeable, simple – simple in the nicest possible way type of managers, ‘That’s what we’ve got to do, those are your tasks, go away and do it,’ sort of, ‘and I’ll kick your arse if you don’t,’ they were very much that sort of chap, yeah.

*Hmmm.* *Is that a difference compared to ICL previously?*

Yes, I think most British management would be much more tolerant, negotiable, yeah.

*Hmmm.*

But that was a – a one-off situation, this is nothing anti-American you know.

*No no, I’m just sort of wondering, you know, if they brought any particular American management techniques with them that were different or –*

Yeah, a bigger pair of boots. [both laugh]

*Hmmm.*

[1:01:05]

*And how long were you at Reading for approximately?*
I can’t remember now, I can’t remember, it’s – I’m sorry, I’d have to plot out a – as I was saying, a – a flow line.

_Hmm._

But it wasn’t Reading so much as Bracknell, moved from Reading to Bracknell fairly quickly.

_Hmm. Can you describe the building you were in to me?_

Which one, the Reading one or the Bracknell?

_The Bracknell one._

The Bracknell one. The Bracknell one had been designed for ICL to stand on the banks of the Thames at Reading, so when it was reproduced at Bracknell it had a nice balcony that once was supposed to look out over the Thames but now was completely superfluous [both laugh]. Eleven storey building, lifts each end, about 100 people on each floor, and there was a – a lecture hall and canteen block on the side, excellent, no – no problem with it really, yeah.

_Hmm._

Also various interesting little management things came my way, the place was full of fluorescent tubes as you can imagine, and there was a great argument whether we listened to a contractor who said, ‘The right thing to do is to change the lot,’ or listen to other people who said, ‘No, we will change the tubes as they failed,’ because many of the tubes that were changed in – en-mass were quite good of course and had gone on for a long time, but the economics worked out in the end that it was better to do that because for changing individual tubes when they went, people had to walk around with ladders and go up and do them and, yeah. So change the lot was the – the – the order of the day.

_Hmm, because of the installation problem?_
Yes.

_Hmmm. We also – I didn’t actually ask you what – what Letchworth was like? What sort of facility was it?

No, I’m going to spend a penny –

_Oh certainly, I’ll pop this on –

And then I – yeah.

[End of Track 13]
Track 14

Yeah, so how did the layout of Reading compare to the layout of Letchworth – or Bracknell sorry, compared to Letchworth?

Sorry, Letchworth to Bracknell. Letchworth and Stevenage five miles apart, manufacturing plant in Stevenage, sorry in Letchworth, development activities in Stevenage in a new laboratory and big development blocks there. The difference between the two, I lived a fair way away from both sites so my social life and my work life were quite different. [Pause] Can’t think of anything else really to say, Letchworth as a pleasant first garden city it was called, it had been one of the very early planned towns, somewhat Quakerish in its evolution. Very pleasant.

What was the actual ICL facility like?

Typical factory on the outskirts of the town … trying to think what was different from any other factory really, I can’t [laughs] think of much, you know.

Hmmm, again having not gone into that many factories, could you describe it for me?

What a factory?

Yeah, no well the factory at Letchworth. [both laugh]

The first factory at Letchworth that I was employed with, not in, had been developed as the manufacturing unit for British Tabulating Machine Company I suppose in the 1930s, it had a – a red brick office block in the front and behind it row upon row of, I don’t know what you call it, northern light sloping roofed factory areas. One abnormal thing that you wouldn’t normally see, it had a vast underground storage for vast numbers of mechanical pieces that were needed for punch card equipment, why it was underground I don’t know but it was. There was a – a good works canteen associated with it, again not much different from any other works canteen where you queue up and you take your food and you pay for it and you go and sit down, yeah, and not much problem there.
So you need things like clean rooms to build computers in?

The computers were not built in that particular factory, I’ve been talking to you, but in a second factory also in Letchworth, which was very much the same as I’ve been talking. Not many clean rooms no, no clean rooms for producing the sort of computer that we were producing, that’s the HEC machines at the lower end. But of course you did have things like spray shops where there was paint all over the place where the panels went in and were sprayed and baked, that was true, yeah.

Hmmm.

And of course, again, a large office block where all the paperwork for them – production control was carried out.

Hmmm.

[03:46]

... Shall we go back to Reading?

Yeah sure.

Or Bracknell – I keep calling it Reading, Bracknell [laughs].

Bracknell, okay.

Hmmm.

Bracknell had a large car park round it of course. I do remember that the Americans wanted to fly around in helicopters ‘cause it was the thing, you know, so a number of big electricity lights – standard lights, probably twenty, thirty feet high had to be taken down so as the helicopters could take off and – and different – but this was just a – a fad that disappeared in a few weeks and then they – there we are.
It all sounds very dramatic though, you know, bringing in American consultants and having them helicoptered in is [laughs] –

No, no, they only helicoptered once they got there, because they decided that it was quicker to helicopter from A to B rather than go by public transport, which it probably was. But like all these things it was really a fad and it wasn’t really. And it was – what’s the word I want, it was a – a statement of – of status, very much so.

Hmm.

I was dead scared because this damned helicopter came in and out right over the computer room and if it had crashed on the top of that that would have been five million quid up the spout, you know, so I was not very happy with them.

[Laughs] Hmmm. It’s interesting you sort of talking about being helicoptered in as a status thing, I was just wondering, you know, are there any status things for a manager of your level, apart from the management dining room?

That was one of them for sure, having a car, having a company car was a very strong status thing. Having a secretary was a very strong status thing. That’s about all I can think of at the moment, yes, cars, secretaries, yeah.

Hmm. Do you actually – what sort of company car do they give you?

You could actually pick it within a certain CC rating, yes. I mean within reason, yes. Gosh, I had a whole string of cars … the – the [laughs] – the most impressive car I had was [laughs] – when this company called CDL was set up and it was – I – from a manager’s point of view looking back it was vital that the key men, such as myself and there was another bloke called John Wensley, were kept happy ‘cause they were the key, they mustn’t be poached by somebody else. So we were offered cars and I went to our administrator and said – he said, ‘What sort of car do you want?’ and I said, ‘Well, don’t really mind,’ I said, ‘it’d be nice to have a shooting break ‘cause I go on holiday, could put all the camping stuff in the back,’ he said, ‘Yeah, that sounds
reasonable,’ he said – he said, ‘I think we need a big shooting break,’ ‘What for?’ I said, ‘Well carrying equipment about,’ ‘What equipment?’ he said, ‘Well we don’t know yet ‘cause we haven’t designed it but we need a shooting break don’t we?’ I said, ‘Yes we do,’ so he said – and I said – and he said, ‘And it’d be nice to have a powerful one wouldn’t it?’ I said, ‘Yes it would,’ ‘cause he – this was a game, you know, play acting, so he went out and bought a Morris Isis which was a shooting break with a bus engine in it, a six litre … bus engine and it was one hell of a car that was and it used to go like hell, it was really grand to drive. It had a … petrol pump in the back connected up to the – the petrol tank was in the back, the pump – and as you drove along you could hear this petrol pump going tick tick tick tick tick tick and you put your foot down and it went [faster] tick tick tick tick tick tick and it was six ticks a penny and so the – the [laughs] amount of petrol used on that car was horrible, did about fifteen miles to the gallon, but that was abnormal and – but it was fun while it lasted. The other things they usually – either shooting breaks or family saloons of about 1500cc’s, that sort of thing, but not top – not top of the range or anything like that, they would – they would be Fords or – or Morris’, yes, yeah. But of course the great thing was that they were maintained and fuel put in them by the company, so that was grand, yes lovely. Even – even a journey to and from work you see was – was paid for, yeah.

_Hmmm. Did ICL take care of its employees in that way do you think?_

[Sighs] Delete in that way; did ICL look after its employees? On the whole yes, it had a good support service for – for the staff side, yes. Yes, it wasn’t at all a bad employer, no. Though of course – I say though, the manufacturing side was heavily unionised and so that was a rather different area of the company for the rest, yes.

_Hmmm. What’s a shooting break?_

A shooting break, what would you call them now, a car with a glass and wooden back part.

_Sort of like an estate?_
Yes, an estate car, a shooting break was an estate car, that’s right. Yeah.

Are there any other perks for working at ICL?

Perks at working at ICL. Free meals for me, free lunches in the management dining room … perks. A reasonably holiday, four – four weeks holiday. As … I worked up the management tree and because the company realised that these new university educated development managers were a different … asset to the rest because they were mobile, where the other people were Letchworth lads or Stevenage lads that had worked from cradle to grave with the company and supported by the company, so how do you – you hang onto these valuable assets? And one of the perks we had was free BUPA, BUPA yeah, that’s right and I still have that which is – which is sheer – what do you call it, clerical error on somebody’s part years ago but I still have it which was very good. What happened was that a company called PPP came along and said, ‘We want to take over from BUPA,’ and the company said – ICL said, ‘But we’ve got people in BUPA and they’re very happy,’ and they said, ‘No problem,’ said, ‘we will give them free PPP if this swap takes place,’ so this happened and I am still getting free PPP, but that’s been superseded by other companies in the meantime, but I’m still getting free … hospital and medical care, which is starting to come into its own after all this time, ‘cause for twenty, thirty years I certainly never even used it, though my wife did have a hysterectomy which was paid for on this which was good. So that was one perk that – that had. Company car was the other perk I can think of. Various purchasing arrangements which most companies have where you can buy things through the reduced rate from the company, what have you. But that wasn’t very strong, not used very much. Yeah.

Hmm.

[12:00]

You mentioned golf somewhere else in passing –

Yeah, that has no relation to my ICL career or anything like that. But that’s my daughter who just happens to play golf, no problem.
I was just thinking, you know, is that –

No no, no perk –

Stereotype about executive life in the ‘70s. [laughs]

No that’s very interesting, it’s not like the American companies which have a company sports – well a company sports facility where … there would be a clubhouse and people would go there. The manufacturing plant at Letchworth did have that very strongly, there was a company sports facility with sports ground and changing rooms and – and a bar, and it – I think it may even still be running to this day ‘cause I was asked ten or so years ago to go and give a lecture there on – on – and all my old pals turned up out of the woodwork, and hello, and that was grand. Talked about what happened, yes. But other – other perks I can’t think of any in particular.

Hmmm. Do you go to things like –

Oh sorry, perks, another perk I suppose, no clocking on or clocking off, you – you – you did what hours you thought you should do, yes, yes. So nobody says, ‘Oh it’s five past nine, you should have been here,’ yeah, ‘cause you’re usually here till seven o’clock in the evening anyway, hmmm.

Hmmm.

[13:18]

Did you go to things like trade shows or conferences or …?

Ah, yes I suppose that – in a way that was a perk, when I became chief engineer I became BTM or ICT, ICL’s representative on a – what do you call it, a – you’ll think of an – an organisation called ECMA, E-C-M-A, European Computer Manufacturers Association.
Trade association?

A trade association and very good. And all the computer manufacturers in Europe, of which there are about eight or nine including three or four American ones, belonged and we held meetings regularly in the various countries, according to who was hosting that year and so I went to – to some smashing hostings. One was in Venice where the Italians, Olivetti, hosted us in – in – in Venice which was absolutely lovely as you could well imagine with gondolas and lovely food and looking out the Grand Canal and so forth. And the – the meeting was held in the big … musical conservatoire overlooking the Grand Canal which specialised in Vivaldi, and while we were holding our meetings downstairs there was somebody always playing Vivaldi on some – so it was rather grand, absolutely lovely. So that was – that was great. And what other lovely perks did we have on that front? Very good one run by the German company up on – nearly up on the Baltic where the speciality of the place was eels which they caught in vast quantities and so we had lots of boiled eels and what have you. And it was Schleswig-Holstein, Schleswig-Holstein I think it was where Queen Victoria’s black horses came from, there’s a piece of useless information. Now what else did we – areas did we have grand time with? Oh one little story about – oh often met in – in Geneva, many of the messages – meetings were held in Geneva which again was very very pleasant … I’m just think … about the Geneva business. Oh yes, there was the Americans and there were the – the Brits and the French and the Germans and the Italians and the Swedes, and I was in my hotel room and the … the previous president, chairman – chairman, not president of this meeting had … drifted away, he wasn’t there, so about eleven o’clock at night there was a knock on my door and there were two of the chaps, ‘Can we come in?’ ‘Yes,’ they looked rather bashful and anyway they came in and sat down and I said, ‘How can I help you?’ and they said, ‘Well we were wondering, would you be willing to be chairman of this meeting?’ and I said, ‘Yes,’ I said, ‘yes I would,’ and I said, ‘Why are you choosing me,’ I said, ‘for my technical knowledge?’ ‘Oh no, we can understand what you say, we can’t understand these Americans,’ [laughs] so that was the end of my little inflated ego, but I became chairman and that was all right, no problem.

Hmmm.
That was again a waste of time because none of the manufacturers actually listened for one moment as to what we’d decided to do as a group, they went their own ways. Yes, I suppose it was a – an ear to the ground as to what was happening, but again people put on committees like me usually are not the people actually doing something, those have got not enough time to swan around Europe on committees, but it was grand, I’m not – not complaining for one moment.

Did they fly you first class or business class, economy?

Can’t remember what particular – I don’t think it was first class, no I don’t think it was, but no – no problem otherwise, everything worked well. Excellent. Oh one of the meetings was in Stockholm which was a gorgeous place to go and I then – first time I went on the Stockholm Railway which is cut in the rock, the underground railway, way down there and so at times it’s like being in a cavern, like a trolls cavern – cavern with all the – the rock exposed, very beautifully done. And also let into the floor were compass roses so you knew which was north south east and west which was interesting, you know.

Hmmm. What actually happened at these ECMA meetings?

ECMA meetings, oh right well you have an agenda of course and then you – produces it and people would talk about what’s happening and what pressures on the industry, sort of pressures that would be during my time was … keyboard operating and people got – now again I can’t think of the term, but there’s a sort of cramp that people doing repetitive – strain –

Repetitive strain injury?

Absolutely, repetitive strain injury and it was thought that keyboard operating did this, and that was dynamite of course ‘cause keyboards were absolutely vital to the whole business, so we took up that and we specified a new design of keyboard, ergonomically arranged that the keys were in the right position and that sort of thing, which everybody ignored but nevertheless it was a good piece of work which we did.
Repetitive strain injury, one of the troubles was this, that in the early days of typewriters keyboards, ladies worked on typewriters, they needed paper put into them, the paper had to be put on sideboards again [interviewee meant keyboards], another piece of paper, the carbon paper had to be put in, it was – there were lots of other operations other than pressing the keyboard. Then the next phase was computer operation on the keyboard in reaction with the computer, which you pressed more keys because you hadn’t got to do any ancillary operations. And then specialised machines purely for data input with a programme supported thing and they – the girls had to work flat out on those keyboards all the time, so possibly the key operations had doubled between what they used to do and what they did on these very high speed input devices. So there was some feeling that repetitive strain injury might have a background, but again – how did we do it? We had one chap who was on – from a consultancy who had done some work on it and we’d decided that it – the problem was that nobody could prove it, somebody just went along and said, ‘I’ve got repetitive strain injury,’ and so somebody would say, ‘Well prove it,’ ‘Well I’ve got the strain,’ you – there was no measurement for it, it was psychology, possibly very real, I’m not saying it wasn’t. So that was one point, keyboard layout was another one which I’ve just said. What else?

Then there was the usual kafuffle about birth defects and what do you call it, localised spots of birth defects due to overhead transmission lines and so forth, but we – we just marginally got involved in that, I can’t think why but we did.

Oh it’s curious for the computer industry to be involved in that [laughs].

I’m trying – there was a computer input to it somewhere and I’ve forgotten what it was. What else did we do? What else did we do? I can’t remember anything else just at the moment, no.
What sort of other people would on these committees?

People like me, seconded from – each one from the firm, there’s be a Olivetti representative, there would be a – a Machine Bull from France representative, there would be Siemens representative from Sweden, do I mean that … Ericsson from Sweden, sorry, Holland would be Siemens and so forth, British Tabulating Machine Company from – oh ICT, ICL from there. IBM were on it … two other … American companies, I can’t remember which they – which they were were on it as well. About nine or ten of us.

Hmmm.

And very interestingly psychologically, when I got – I used to write up reports as to what had happened and they’d be circulated and I’d honestly say to my boss at times, ‘Do you really think this is worth it?’ I mean what a sucker I was to do this but I did and you could see his mind twitching like this. If he said, ‘No, we’ll stop it,’ and something went wrong, he would be to blame, if he said, ‘No, I think we’ll go on it might be useful,’ then nobody could blame him, so it rolled on for that reason. And I think that various other things in industry happened, this – people do want – do not want to challenge the status quo ‘cause if they do and it goes wrong they’re to blame.

Hmmm. It's interesting that, you know, all these other computer companies at this meeting as well, I was just wondering, most of them are your rivals, how do you get on with –

Oh beautifully, no problem at all. Mostly because we were miles away in the organisation from the people that made the decisions about how many to sell, what we’re going to sell, where are we going to sell it, we were not in that team and nor were the other blokes we were dealing with. The other sort of things we got were many health and safety issues in various ways. Computer inks were rumoured to be carcinogenic at one time and we had to take that into account, so all sorts of – I think computer operator interfaces were our main field of – of thinking, but nothing like standardising programmes or order codes or anything like that, no. What’s – it must
have folded ‘cause there isn’t a British – there isn’t a European Computer Industry any longer, so it just must have disappeared, but anyway, good fun it was while it lasted.

[Laughs] Interesting that, you know, there were IBM there as well who I don’t imagine as a European company and –

Oh they are, they’re a worldwide company. Oh yes. Oh … and the same with the American manufacturers, they weren’t – sorry, the other American manufacturers, they didn’t necessarily make in Europe, whether IBM made in Europe – yes they bloody did and they had development laboratories in – in Europe, yes.

Hmmm. Are there any people you did get on with well at these meetings or people you didn’t get on with?

Oh excellently, we never had any – as far as I remember any friction amongst any of them, none at all. Ah we used to have the extraordinary things about one of the French operators had been told because of De Gaulle, la gloire, that the language was not English, it was English and French, and so when the whole of the meeting was finished and the other blokes were going out of the door, I as chairman had to stay behind and okay his translation from English to French. Incredible, and of course he spoke perfect English as they all did, but the French were very much focused on la gloire.

I didn’t know you actually spoke French.

Say that again.

Do you speak French?

Me, I do personally, yes.

Oh oh.
Yeah, enough.

[Laughs] But was that useful in this sort of international situation or –

No [both laugh] because everybody spoke English, yes, yeah. But there we are.

[26:21]

Moved onto your time of chief engineer and I was just wondering how you made that transition from being in an administrative job in Bracknell to being back in a semi technical job as a chief engineer?

I had not the slightest difficulty because I was technically competent, yes no problem at all. But if you say, what the hell was my job, that’s a much more difficult question to answer, what did I do as a chief engineer? The answer is on the whole scratch around and see if there was anything I could do that was useful. Occasionally there was something that needed somebody to stick their neck out. For instance we had a computer, this thing called System Ten which had a computing box and all the electronics were in the back and it was all very low voltage, so if there was a fault the customer could be told over the telephone, ‘Change printed circuit board number seven,’ so they would get the key, open the back like this and like – and put it that way. And then some self – health and safety chap pointed out that at the back of this cabinet, down on the floor, probably that far [demonstrates], two feet away down at the bottom, there was some exposed mains voltage, bus bars like this you see, and he says, ‘Well somebody’ll get a shock off that,’ and so this all went round and round and round and round, do we take the risk, or don’t we take the risk and so eventually it landed on my table. So I thought, well, let’s look at what the possibilities – by the way for some reason you couldn’t put your finger across this, it had to be something else. So I said, ‘Well what metallic thing would possibly come there,’ and then somebody decided that somebody would have a – a necklace which had got a – a medallion on it, this sort of thing. The – the problem was that somebody might get an electronic burn on – on themselves, which might turn cancerous, so I did a little sum that the chances of this are 500 to one, then 200 to one, 1,000 to one or something and it came out at the end that in order to have this sort of accidents, the
change were half a million to one and so I said, ‘That’s all right,’ so [laughs] – so
whether it was sensible or not, but they took my word for it or they’d looked – looked
at the – all they wanted was an excuse from somebody in power to go on and I gave
them that. And my neck was out of course, there we are. But a funny old world.

[Laughs] How did you actually become chief engineer?

My boss said, ‘You’re chief engineer,’ that’s how I did, just like that, yeah. Because
we were setting up an engineering area at Bracknell as distinct from the programming
area and it was necessary to have some technical focus for this lot, so there was a
chief engineer up north so I became chief engineer down south.

Hmm.

And I was used as a cats-paw and – and a guru on many thing – like that thing I was
telling you about. Another one was that … the Ferranti part of the company up north
had become very very bureaucratic and they had standards for everything and
volumes of this for this, where the world was rolling forward at a hell of a rate and
just couldn’t take chance for everything to be tested and put on the stand as this and
so forth. Very much as I was saying earlier, with the development of airborne radio
sets when at the beginning of the war the British government developed ones were out
of date and took a long time to get any changes made on it, where industry was just
charging ahead. Now the same thing happened in – in-between the north and south of
the when I became chief engineer down south. Up north they had a vast bureaucratic
system of checking every resistor, nut and bolt and had to be in an – into a manual
before you could use it in the machine, where the world was just charging ahead, so
you had to effectively say – you have to trust the manufacturer that he would deliver a
decent thing to you. So I had fights with my northern – friendly fights, he said, ‘Well
you can’t do that because it’s not standardised,’ and I said, ‘Well you’ve just got to
get on, we’re going to do this,’ and so, yeah, there was a – a job in that way, yes.

Hmm. Was there a north-south split in ICL, you talk about, you know –
Yes, well that was because the ex-Ferranti and English Electric lot were north, Kidsgrove and West Gorton, and the old BTM lot were in the south and Power Samas at Letchworth and Stevenage and had been at Whyteleafe which that the Power Samas lot that – that got overtaken, so yes there was a split.

_Hmmm. Did you have much –_

The Ferranti – oh the Ferranti machine up north produced the large computers, the Letchworth Stevenage produced the small computers, so there was a – a split in the size of computer which they manufactured.

_What would be a large or a small computer?_

Oh, depends on what date you take?

_Let’s take the time you’re chief engineer?_

… I’m trying to – I can’t – on store size, on speed, on the peripherals? I suppose – let’s put it who would use the damn thing. A small manufacturing company, 100 employees would use the sort of machine that I’m – in the small end, but above that it would probably be a large machine. Any company that had a central base and a number of distributed facility – computing facilities would probably use one of the big machines, but the – in types, on the 1900 range the 1904 and above were West Gorton, 1903 and below was Letchworth Stevenage.

_Hmmm. Did you have much to do with the north part of ICL when you were working –_

Yeah, quite a lot, particularly as chief engineer because I met my companions up there. Particularly – well no, both West Gorton and – and Kidsgove I used to visit. What for … I can’t remember any sort of specific reason but … mostly trying to get the two halves of the company together, to coordinate between what they were doing and what we were doing, because they would decide to do something and spend five million on it and we were doing roughly the same thing down south and spend five
million on it, so wouldn’t it be better to do the same. But this gave the problem that,
as I say, the north were very bureaucratic and centralised in their standardisation
process of manufacturing and what have you. I mean I’m not grumbling at it, there
was a good reason for it, where in the south was very much, is it in the company’s – is
it in the manufacturers catalogue, let’s buy some of those, we’ll use that, with no – no
check on sending them away to some assessing house to see will that nut and bolt
actually do the job, you had to test – well did trust the high quality mass production
manufacturers that were making whatever they were, valve bases or nuts and bolts or
resistors or what have you. They were the leaders in the field and we used their
products. And on the whole had no trouble at all.

It’s interesting that you describe this split in what seems – you know, is nominally the
same company.

A lot of it I think was historic, because various people knew everybody up north and
they had a way of doing things and we down south had a way of doing things, yeah
yeah.

Hmmm. It’s interesting that, you know, you’ve been the same company a while, that
split is still there in the ‘80s, it –

Oh yes, I would think it would go on for generations, I can’t see why not, vast
numbers of people, know father and son, work in the firm, yes. It’s a long way apart,
why should they all travel in large quantities and suddenly say, ‘Oh we’re all pals,’
why? No driving force to do that.

Are there any other ways you think the north and the south differed as far as their ICL
parts go not – not just generally. [laughs]

… Not really, no not really, no no … no.

Hmmm.
But the – the south was essentially a much higher volume producing area of simpler machines, the north built huge machines with more complexity in them, hmmm.

_Hmmm._

That’s a great simplification but it is [inaud]. Oh the other thing is the two chief engineers were sometimes uses as cats-paws, as you can imagine, to sort out problems in the other side. Supposing there’s a – as happened in my case, the manufacturer of certain printed circuit boards was in a hopeless state, there were rejects all over the place and delays and so forth, so what’s gone wrong, so I was sent up there to sort it out and being a sensible chap I sort of rang up my oppos up north and said, ‘What do you think about this chap?’ ‘Oh ble-ble-ble-ble,’ and I knew the answer before I got on the – the train to go up there, or in the car. So I’d get up there and listen to all this burble from the – the blokes doing the job and having … done my homework I could ask the crucial killer question, whatever it was, such as, ‘What happens when one of these board fails?’ ‘Oh we do this and this,’ ‘Ah but that doesn’t cover that,’ ‘Oh no it doesn’t,’ you see and that – that’s a good use of a chief engineer, it wasn’t that I was clever in any way at all, it was just that I was a cats-paw that was used to sort out a problem and that chief – northern chief engineer sometimes came down onto my territory to – to act as a cats-paw in something like that, yes. Just ordinary human behaviour. [both laugh]

_What – does a chief engineer have anything to do with new computer development?_

New computer development … not much at that stage. During this particular period the company was moving towards and producing the 2900 range of computers which took over from the 1900 range, that was centrally planned and – not exactly centrally designed, but at least the – the central building blocks were all decided and done, great success, but as a chief engineer I didn’t have anything to do with that.

_Hmmm._
Because also don’t forget, I was chief engineer of an area that didn’t do any – on the whole electronic development, as I was saying that they were mostly software down south at that time.

_Hmmm. What’s a typical daily working day like as chief engineer, does it differ at all from what came before or …?_

Not really, no no. Yeah, go in and look at the post, wait for the clock to come round, go and have lunch, have a nice drink. I’m joking. But no, seriously it is quite impossible to answer what a particular day holds and what you do, no. One thing was that I tried to get people to use – firstly to use keyboards ’cause many people hadn’t used keyboards so I mean at – because PCs weren’t popular, they weren’t in, nobody had PCs, they were just coming in, so why should people use keyboards, their typist did their typing for them and so forth. So arranged for – have a number of do it yourself – teach yourself to type machines set up in the computer room where people could go down and do that. What else?

[40:03]

There was something else of a similar nature which I got going. At that day, the beginnings of what I might call universal software tools, there was – god I can’t remember the name of the thing, this is a – a computer programme which runs on almost all PCs that can tabulate things in rows and columns and manipulate numbers.

Spreadsheet?

Hmmm?

Spreadsheet?

Spreadsheets, that’s right. Well there was a piece of software that specialised – one of the first pieces of software that was a universal spreadsheet machine.

VisiCalc?
That didn’t – doesn’t ring a bell but it might well be it, so in other words I again I – I gave a little couple of lectures to groups of people, saying, ‘Look, this tool exists, you know, can you make use of it?’ and some did and some didn’t, but – so in other words, yes I had a seeding apparatus – role.

[41:05]

You mentioned your use as a company guru a little while ago, I was just wondering if you’d mind talking a little bit more about that and unpackaging a bit, in what sense were you a guru?

Guru? [mispronounces]

Guru, a guru [both laugh].

G-u-r-u.

Yes.

… In all honesty I can’t say much – much more about that. Because I was computer literate and read all the magazines and knew what was going on I was a source of information, naturally, and – and advice, yes, difficult to – to give any exact example of how that happened, yes.

So people would ask you for their opinions on their own projects?

Yeah … yes. I mean very interesting things, something … in producing a computer, whether you use hard tooling or soft tooling, if you wanted to make the covers say for that printer there, cheaper soft tools – the tooling might cost – to have a tool made 100 – say 1,000 pounds, and when you got it going you could produce fifty of them and so much, but if you wanted to produce 5,000 of those things, it would pay you to go to hard tooling which is much more expensive, but you could produce more. So that was a typical engineering decision that I might have some help on, yeah.
And were your decisions mainly on the engineering side or the software as well –

Well I was – no no I was a chief engineer.

_Hmmm. So, you know the software engineering tool, I wasn’t sure if it was covered by [laughs]_ –

No no, that’s not real engineering, no no.

[Laughs] _Oh, did you get to actually initiate any projects as chief engineer or –_

Not that I can think of, no, no not at that time, no. No no. No, as I say my – my days of actually designing computers was – were regrettably over, long over. No.

_Do you find that your managers took your advice well …?_

Some did some didn’t, depending on what their – what axe they were grinding, yeah. Nothing – all human nature, there’s no [laughs] – so if some manager stuck his neck out and that’s what he’s going to do and he’s kudos depends on it, then he may take a different view from what I was recommending, yes, depends doesn’t it, it’s human beings.

_Hmmm. Whereabouts do you actually sit in – in ICL as an organisation at this point?_

Oh pretty low down by this time, pretty low down, oh yes yes.

_Chief engineer sounds like quite an important title though, it’s –_

But it isn’t, it isn’t, it was – no, no no, way down. ICL at that time was also splitting up and little bits were shooting off, there was a government bit that was set up and another bit for developing … input and outputs for supermarkets and a vast contract in Germany where we got a vast mass of – and so the company was – was in a changing mood and, yeah. No no, by the time I was chief engineer I was a has been, I was …
I’d been the bloke that had been famous for developing the early computers, what the hell do we do with him, sort of you see. So didn’t run a project at – as being a chief engineer, I controlled a few chaps supporting engineering and that sort of thing, yeah.

*Sounds almost like an in-house consultant then?*

Yeah, yes very much so.

_Hmmm. When did you actually become chief engineer again, just so –_

Can’t remember – can’t remember, no use.

[Laughs].

[45:30]

Well why don’t we move on from this, I think we’re flogging a dead horse.

*I’m just wondering, you know, where does it end, when did you stop being chief engineer and leave ICL?_

Well I think probably when I retired.

_Which was –_

Which is when I was sixty, right’o, which was in – twenty-three, in 1983 that was.

_Hmmm. Was it an easy decision to make?_

I’d got no choice, they said, ‘You’re retiring,’ you know, the – the – there was a – a vast large shedding of staff, I don’t know – perhaps 1,000 throughout the company were shed at that particular time, yeah. So those that were – could take early retirement did, and I was one of them.
Over that really long career in ICL, do you think there are any big changes that occurred to you?

Well the company changed vastly, from a tiny little electronic – with three people in a lab to a – a company producing vast quantities of computers, punch cards had entirely disappeared, the world was quite quite quite different, quite quite different.

What do you think the most dramatic changes were you’d seen in computers over that period?

Oh what a question. Most dramatic, no I’m trying to – to answer it honestly … dramatic … there were whole list of changes on the electronics side of course. Valves being displaced by transistors, wired components being replaced by – printed circuit boards with the components on, integrated circuits replacing resistors, capacitors and what have you. And then after integrated circuits, really large integrated circuits with processors on a chip of course and stores on chips, so vast shrinking of the size and – and necessary power to drive that size in the computers, and of course storage doubling every year, whatever it was, a fantastic rate. But I cannot think of one particular crucial thing, there were – they all came one after another. And the same on the storage side, started off with no stores except punch cards, then a magnetic drum came in that – that stored that, then some people used paper tape loops to store – store information on, then the core store came along, little tiny loops with wires threaded through it. Mag – but also at this time there had been mercury delay lines of course and then they were superseded a certain extent by nickel delay lines, so the evolution on storage was amazing and then computer chips came along where you stored things on them and the world was entirely different again. I’ve forgotten, magnetic tape was in the midd – came along in that – which ruled for ten years or so. Punch card was out, so forth. So that – what have we looked at, we’ve looked at … type of storage, we’ve looked at type of physical devices used to make the machines in, there was the vast software revolution which to me was not my – my field, but when I was evolving the first computer, there were absolutely no software engineers whatsoever and I had two … vocation students, bright lads from universities who I said, ‘Well write a programme for this machine,’ and one of them wrote a programme to do – I think they’re called magic squares, where the numbers across and down of
this square all add up to the same number, the whole range of – so he built a little machine for demonstrating that, and another bloke who became the first computer programmer as far as I’m concerned, was a bloke called Harold Ashforth and he programmed the coal board payroll, have I talked about coal board –

You talked coal gang payroll.

I think I’ve talked about this before.

Yeah yeah.

Which was a batch payroll and you couldn’t do this on punch cards as you could on a computer, so yeah. So – and then the – the programming world went on, people writing first of all individual routines to do a payroll, what have you, then people started to have an operating system that helped you run these to the machine, and then it went even further where the – the programme was completely detached from the machine it was running on, it didn’t matter whether it was that black box or that black box, what the software in that machine was, what the function code was, if you used this operating system then there was a line between the programme and the actual physical apparatus. What else?

Interesting you were saying earlier about changes in the way that you’d actually designed computers.

Hmmm hmm.

I don’t think we’ve mentioned this on tape and it seemed quite an important point at the time.

How you design computers. When I first joined it could be all in one man’s head, which was gorgeous ‘cause it happened to be mine. Then as the time went by and the next couple of years, then I could delegate various bits of the design to various people, particularly the input and output went to one group to deal with the punch cards and what have you, another chap might deal with the storage and so forth, with … an
overall logic which I had produced and they would produce those various bits. Then we went onto the 1301 machine where there was a large team of – specifying and producing this machine. Software people would come in, there were ten or fifteen software writers already by that time. Then … a lot of specialist software and apparatus came in, as I think I was mentioning, from getting from the logic onto a piece of physical board, this is placing the components, what the components did, how they’re wired together, and this would produce all sorts of other helps, because how to test it, it would actually produce test routines, or bits of test routines for you, so a great expansion in physically making the machine from the logic to the physical thing you held in your hand, yes. ‘Cause you could simulate faults on a board and therefore show what the output would be if there was a fault of that type, which would help software diagnosis very much. And of course by the time I was doing the 5750 business, computers were often not serviced by the people on the spot at all, it was produced on a piece of wire that went to Dallas or somewhere, or – or – or UK, and the – the fault was diagnosed there and sent back again with an order, ‘Change board A B C.’ So huge differences.

_Hmmm …_

What have we got here? What time do you want to go?

This – this was actually my next point ‘cause I know we’ve got a few other bits to talk about, I’m wondering if it’s worth doing –

Whichever you like.

_Shall we just pop this off for a second and –_

[End of Track 14]
Track 15

Right, so you’ve finished at ICL after your sixtieth –

Birthday, correct.

Birthday and –

On you go.

What did you decide to do then?

What did I decide to do then? Because that – while I was in ICL – funny, I wrote down on the back of a bit of paper didn’t I, a sort of flowchart.

Here you go.

There we are. That’s yours so, okay, I mustn’t forget that. Right … whilst I’d been – been as chief engineer one of the jobs was getting ICL assessed for BS5750 which I helped with, so I learnt about BS5750. Then –

What is BS5750?

BS5750 is a quality standard which any organisation can take which you have to fulfil or show that you’ve – that all sorts of good things are done, like you’ve got a – an organisation chart that what people are responsible for, you’ve got standards, you’ve got a method of dealing with errors, so on, there are about twenty of these different clauses in the standard. It was – the Americans evolved it because they found that when they were making military apparatus, they couldn’t guarantee when they went to a particular organisation that they – they will find the vital things that enabled them to reorder or move that design to somewhere else, so it was a method of controlling the production and quality of military equipment. So then it moved over here and then spread to almost any industry you can think of, we could have BS5750 for what we’re doing together but we’re not. So anyway, because I was known to the chap that had
gone to BSI to set up BSI’s assessment under 5750 computer equipment where you have to write a whole – a whole lot of new technical sort of questions and I knew my stuff, he sub-employed me – subcontracted to me with – you know, working with him assessing companies for 5750 which were computer companies. So I then had this glorious time of two or three years going around on the whole the big computer manufacturers, including ICL out of interest, to get them ready for 57 – no, were they ready, could they be granted the certification, which was a set process and you went through this. Then … British Standards Institute decided they would do this in-house and not subcontract it out to people like me, so I lost that job but at the same time the British government had – wanting to encourage this work had – through this production institute whose name I forget, it’s at Melton Mowbray had said, ‘If you … want to,’ to a company, ‘if you want to get 5750 you can employ a consultant and we will pay that consultant so much money to – for – to help you get 5750,’ so I had a grand time going around a whole list of companies, mostly small companies, helping them get 5750 and made a lot of friends and visited – probably forty or fifty companies I did this to, for which there was a set fee of 15,000 pounds or something, so that was great. And so that’s how I spent my earning retirement till I was about seventy-two, seventy-three, so that was good, was good.

What’s actually involved in preparing a company for –

5750?

Yeah.

First of all you explain to them what the standard means and what each clause means and you say, ‘In your sort of industry this is what you will have to do,’ because it depends on what they’re doing as to which clause, and there’s twenty clauses are particularly vital to their business. Anybody for instance with physical stock, spare parts, manufacturing where different models come in and supersede previous models which have to have drawings, which have to have test routines, which have to have stock control, so all parts are uniquely identified and cannot be confused on with the other and which one is – can supersede another and which one can’t. Also if there is stock which is suspect because it has been used as a spare part on some other machine
and come back into store, or has – for some reason been assembled and then
disassembled, then that has to be segregated and somebody in charge, particularly a
chief engineer [laughs] has to be – to show that he has thought about whether this
stock is fit for purpose and if it isn’t what tests need to be do – to be done to put it in.
So that’s a typical example of an area of 5750 which you have to set up. Let’s think
of other things … you have to show you’re an organised company, what your staff is
and what the names of the particular officers are, both physically and whether they’re
chief engineer or whatever their name is, what that employs, what their terms of
reference are and how they inter-react, so the organisation of the company has to be
set up. You have to have a – obviously a very strong checking – testing and checking
ability to decide what can or cannot go out the door, because quite often something
with a – with a minor fault can be sent out of the door, such as a scratch on a panel,
you know, it depends on are you controlling it. And the crucial question is, ‘Show
me,’ in other words, you go around there and the bloke says, ‘Well what we do le-de-
de, oh it’s perfectly under control,’ ‘Show me,’ so that’s one thing. And then the
other question you have to ask is, ‘If you fell under a bus, how would your successor
take over?’ so you have to show this crucial steps in a – in a – in a management
organisation. And some of the companies we went into we uncovered the most
extraordinary things, such as the – the managing director would say, ‘Yes we do this,
yes of course, that’s absolutely all right,’ and his poor staff have been brow – brow
beaten into saying, ‘Yes yes yes yes yes,’ and so what the hell do you do, so we’d
take the staff quietly aside and say, ‘Now can you please show me this, I’m [mumbles
quietly],’ ‘Well truth is …’ ‘Please can you show me this,’ you see and quiet
persistence and you eventually find this great mass of discrepancies between what the
boss says and what these blokes says. So all you can do then is the chief assessor has
to quietly take the boss aside and say, ‘Might I suggest we suspend this assessment
because the result will be so demoralising and,’ you can put another word for that, and
what’s the word – other word, ‘show up all the – the terrible managerial split between
you and your staff,’ and you don’t – you have to put it much more delicately and the
chap suddenly realises that he’s got himself into a box and says, ‘Yes, go away, come
back in three months time,’ so you do and then it may have changed by then, who
knows. So there are all that sort of things. Let’s think what else there are.

Are there any interesting companies you remember in particular dealing with?
Oh yes, I shan’t talk about them because it’s – it’s –

*Just be a general, you know –*

No, I’m not going to mention particular companies that I’ve assessed and what I’ve found, no I don’t think that’s fair.

*Not by name I meant.*

Oh I see, okay. Let’s try and think … there are various techniques which you – you yourself employ ‘cause I’ve noticed them, when you’re talking to people to get them to talk at various times, and one of them is silence. People start to get – being interviewed start to get embarrassed when you don’t say anything, just as you are now, just looking at me. And for instance, you’re interviewing something – somebody about something and say, ‘I see that the standard in – that you’ve got here implies you must do this, can you show me?’ silence, ‘Well no no, we – we – that’s what the standard is,’ silence, ‘Except of course at times we do have to go that way instead,’ silence, ‘and in fact what Joe Bloggs said don’t there wasn’t quite true,’ and so it all pours out because the chap is so embarrassed at the silence, the silence rules that particular situation. So you just keep quiet and just listen and he pours it all out. But it depends on the chap of course, he may not be, he may be … stuck in it, but it – it’s highly interesting, it’s a psychological game and I greatly enjoyed it, greatly enjoyed it and I met – met a lot of good people and had a – yes, great time. The … you meet … a very well-known company, which I won’t mention, went into their development laboratories, neat, beautiful, absolutely smashing, oh how gorgeous and there’s a second floor with some stairs going up there and a door at the top, and I say, ‘What’s up there?’ ‘Oh ble-ble-ble [mumbles for effect],’ I said, ‘Can I please have a look?’ ‘Well I told you ble ble ble,’ ‘Please can I have a look?’ so, ‘All right,’ so we go on the stairs and there is this vast floor full of junk, absolutely full of junk [laughs] and – and no labels on it, no stacking, no packing, no anything, just junk you see and you – you say, ‘But, you know, you run a beautiful company and I’ve seen that evident [mumbles for effect], what’s this up here?’ ‘Well [laughs] sometimes amongst this lot, instead of remaking something which we may not be able to remake, we can
find a bit here which will do perfectly well,’ so pause, I said, ‘Well how do you know it perfectly well,’ ‘Well we test it,’ ‘Right, well who says you test it?’ ‘Ah the chief engineer,’ [laughs] or his equivalent, there’s some chap whose word is said, I said, ‘Fair enough,’ I said, ‘all I need you to do now is to put a lock on that door which says that anything that comes in and out of here must be authorised by the chief engineer and I want to see on a piece of paper what it is he’s agreed to,’ and that – they’re happy. But you see before then it had been this quite uncontrolled mass of stuff which people could pillage and might or might not work, might have been faulty, you know, and – and yet they were vast worldwide company.

*I have to ask this, how did ICL do when it came to enfor – [laughs]?

Not too badly, not too badly, ‘cause I had to assess them and one of the other people. No, again I found some – some horrors, how did I find these horrors, because I used to work for the bloody company [laughs]. But there again it – it’s almost all these horrors are history, something that happened in the past which people push over there and forget about, but you can’t because something is going to send you back to that bit. If you understand.

*Could you give an example of an ICL horror?

No. [both laugh]

*The company's not there anymore in its original sense, I'm just wondering –

No, I’m still not going to do it, no [laughs]. The –

*I'll mute it for thirty years, I'm just curious [laughs].

No no no. But again it was typical of the other problem I’ve said, where there were a whole lot of whatever it happens to be, bits or drawings – drawing are the other problem, who last – what standard was the drawing up to, what date was it assessed with, is that the later drawing or the earlier drawing, has there been a change, who
authorised the change. Yeah, all good stuff, much easier to – to talk about than actually do, so it was lovely being an assessor. [both laugh]

[13:39]

*How hard was it starting off your own little company after working for, you know, a multinational basically for …?*

It was an interesting change because when you – I started to assess small companies, then it was – might be only ten or fifteen people in this company and you have to adjust your focus according to what is sensible under a company that size, where they see each other every day and talk. But you have to always remember under a bus, in other words, if somebody falls down dead then how the hell does the company pick itself up? So there are certain crucial controls you have to make sure the company does stick to. So, grand. I had a lot of fun assessing people as you can well imagine. A lot of fun.

*How did they actually take to being assessed, was it something –*

Oh almost all of them – it depends – it depends but almost all of them took it straight on the chin and were quite happy and agreed, yes, logically that’s the right to do and yes they would do it. And so we’d say, right, I’ll come back in three months and see whether you have. And oh that’s the other thing is of course, that if you set up some sort of change process and assessment process, then somebody has to be in charge of auditing whether that is actually happening. People say, ‘Oh we’ll do that, we’ll rewrite this,’ and there it is and they think they’ve done it until somebody checks that that process is in and working they haven’t done it. So people often forget that, they think, well we’ve changed something and I’ve written it down now so that’s going to be all right, but somebody’s got to see that it is. I don’t mean the assessor that’s going to come round, it must be a part of the organisation that does that. What time have you got to go? Not for a long time yet have you?

*No, we’ve got another half hour or so I think [both laugh].*
No, I greatly – greatly enjoyed being an assessor, it was good fun. Many of the blokes that I saw became my friends and we used to go out to lunch together and talk about the world in general, so yes it was a good – good time, good time. And because [sighs] – one you – when you’ve done five or ten of these it becomes almost automatic, you know exactly what’s going to happen, you can prophesise where that bloke’s going to fall down the hole and you’ve got to do it tactfully and quietly encourage him along and so forth. Ah, yes, I went on a training course to do this and part of the training course was how to deal with the final assessment. Having done the assessment, you then say to the boss, ‘We have done our assessment, please can I come and present our findings?’ and there were three different – out of many – ways that you might find yourself in that room, this – as an assessor and [dog growling] how the company deals with this, the first one is the belligerent boss, ‘You’re a lot of shower and what the – how the hell did I let you into my organisation,’ – dogs just happy [laughs] [dog barking], ‘no, I disagree, we’re in perfect order, go away rah-rah-rah,’ so there’s that lot. There’s the other bloke that says yes to everything, such as, ‘Oh yes, did it – that’s what happened, oh thank you so much, yes yes yes, so you’re quite right, we must change that,’ and whatever you said he agreed with it and wouldn’t go – and then the third bloke is the bloke that just won’t listen, the telephone’s ringing all the time, ‘Sorry a minute, I’ve just got to go over there and sort this one out,’ so you get completely sidetracked by that. So there’s the three examples that – during the trainings process as to how to deal with the recalcitrant customer. But it’s grand, it was grand. I don’t know if it’s still running, I think it must be, I think it’s grown a bit into European something or other now and, yeah.

What – what sort of companies are these?

Almost always electronic companies in various ways, make little boxes or cables or plugs or – oh all sorts of things. Most – or service something, they may be a servicing company. I – when I – you know, travel on the motorway I look out and there’s one of the factories I visited, it’s rather fun, yes, rather nice.

[Laughs] Why did you decide to retire in the end? It sounds like you enjoyed the work.
Oh seventy-two, seventy-three, was getting on a bit and so I thought yeah. Another – also dog, I – my wife was dead and I had – the dog had to be looked after in a way so I’m not making an excuse, but the dog was one of the reasons for doing that, but I mean seventy-two, seventy-three is enough, yeah.

*When did your wife die as well?*

1991, twenty years ago just about, 1990 – 1991. December 1990 I think, so she’s been dead twenty years and … yeah, there we are, yeah.

*Hmmm. Not long before you retired then?*

Exactly, I’d retired finally about two years after she died, yes. Oh I visited some gorgeous companies, particularly high tech ones in the Cambridge area which were great fun, making special chips for somebody or other, they were very interesting. Where everything was done on the end of a telephone line 7,000 miles away, that was very interesting to visit, yes.

*Hmmm. So you retired at seventy-two, that’s – that’s beyond the normal retirement age?*

Yes yes, yes about that. And of course the great thing was for that last ten years or so, firstly I was being paid for what I like doing, secondly I could do a lot of the work at home in my own time, thirdly in a way I was the boss, so it was a very good time indeed, very good time.

*Hmmm.*

[19:45]

*What have you done since?*

What have I done since?
Oh bugger all, just cut the grass, yes. No, travel is one of my great things I have done since then. What else have I done? I’m a great reader and I’ve got a large library, mostly travel books … shooting in the shooting season, look after the dog. Children and I visit my children as much as I can in Wales and Sussex, Suffolk I’m so sorry, so yeah, good life actually. But of course you start to – when you get to my age you start to fall to bits and you’ve got to live around that or live through it, yes.

_Hmmm. Any particular type of travel?

... Adventurous but safe, I’m not ... a chancy sort of chap that would go across a – across frozen ice just for the sake of doing it till I fell in, I’m not that sort of chap at all. No I – I wished to – to do it under controlled circumstances and having thought through it, and my desert travels have been exactly like that, I mean you plan ahead and you – and so far nothing’s gone wrong, but yeah.

_I know that we’ve discussed your desert travels a bit over lunch and, sort of thing, but I was wondering when it started?

How did it start, well it started – I suppose it started when I was about ten. In other words when I was young I lived in the country, much – and I had a bicycle, I went everywhere, my parents had ... I was going to put it the wrong way around, no control over me, they had a lot of control over me but they were just quite happy that I was a sensible lad and would look after myself, and I used to cycle everywhere and go to all sorts of places and so forth, so I became very independent. They might – and I was an only child, I think that’s got a lot to do with it. So then, what happens then? I then joined the RAF and get posted to India where I’m on – in the plains of India, Ambala, very hot and sticky but near there is the Himalayas, right along the horizon, so I visit the Himalayas ‘cause I’ve got a little workstation there and visit them at Shimla for a bit and then I decide to take a holiday up in the Himalayas and cadge a lift on a Dakota that’s flying to Rawalpindi where I get on a bus and go up to Kashmir and then hire some horses and go up a valley to a place called Mount Kalahoi so in other words I start to travel there ‘cause the opportunity is facing me. So then what
happens? I then come back and marry, have children and then … we’re poor – not really poor but not – certainly not rolling in money and so hollies, what to do about holidays, so I get a book, very nice little paper backed book about camping in Europe and that sets me off, and so we went year after year after year camping in – in Europe with a tent in the – in the car and visit France and Spain and Germany and Switzerland and Italy, and absolutely grand, ‘cause that was lovely for the kids too ‘cause they – they again became independent and they are in fact independent children. So that was grand so that was how I started to travel then. How did I start to travel further away and longer distances? When my wife was alive I took up scuba diving, which I took up by training in Plymouth, Plymouth harbour, and then went away – I did this ‘cause I’ve got a cousin in Australia, so I went there with the Great Barrier Reef and scuba dived there, then I came back and had a whole series of scuba diving holidays in the Mediterranean, well sometimes my wife came, sometimes she didn’t, which was great. And then it – also scuba dived from – in the Red Sea and that’s what opened the gateway to the desert, so again reading books I found that there was a great Roman ruin called Mons Claudianus up in the mountains so I hired a car and went up there and met the Bedu and saw all these – these ruins, absolutely grand. All – and so it was a ruined – for making columns, vast twenty foot, thirty foot columns, eight feet in – eight – sorry three feet in diameter lying in the desert, big bowls that had been cast – carved out for what have you, so that was grand. And then … the woman who was running the diving trip … was willing to join me on trips into the desert, so I started to plan trips in the desert because I read the books and where you could go and what have you and she provided a vehicle and all the food and what have you and so that worked well, I did the navigating and she did the driving and we went there, and so we saw a whole lot of the eastern desert, east of the Nile, between the Nile and the Red Sea this way and I started to get interested in the Roman Castelli which were in the desert there, which the Romans built when they – the wind was in the wrong direction so they – they used to land the things on the shore of the Red Sea and take it to the Nile across the desert, every twenty miles they built a fort, which was grand. Met a chap there who was excavating for – what’s it called … bits of pottery they scribble on, there’s a word for it, but anyway they used it as their writing tablets, so he introduced me to the … a whole new area of – of exploring to do that. Then I said to the – the … this Dutch girl, ‘I want to go the other side of the Nile, I want to visit the big oasis Farafra, Bahariya, Dakhla,’ which are spread out in a great
arc in the desert to the west of the Nile, ‘can you do anything?’ ‘Yes you can but we’ll need two vehicles,’ no trouble so we got two vehicles and we did a super trip round there [coughing]. So I got very interested in the – in the western desert as it was then, the real desert.

*When abouts is this?*

West – when?

*Yeah. You know, within a, you know, a decade maybe or –*

Oh ’95, ’96, ’97. Ten years, fifteen years ago [coughing].

*So it’s a relatively recent thing you’ve been doing?*

Yes, well no it’s a continuation of all I’ve been saying.

*Hmmm.*

So every year I was off somewhere or other. And then I tried to get a chap to take me to – across the Sahara to Ghana and Niger and those places and we were just about to do that when he had his vehicle stolen that we were going to travel in. So he – I said – he said, ‘Ah but look I’m going to Cairo, can you find me somebody that will go – take me into the desert,’ yes he did so he gave me another contact, a bloke called Andras Zboray who goes every year, twice or three times into the desert looking for rock art, carvings on rocks. Am I all right? You’ll let me know when time comes. Rock art for – and so I used to go and still do with him, I’ve been five times, six times with him and that’s lovely ‘cause he wants people to go – help him find this rock art, so – and of course we share the expenses, he does – all the arrangements and we go out there and we – we do – search another bit of wadi or what have you and find these – these – mostly cows all over the place, but some smashing art – rock art sites really, so that’s that. Then having followed that …

*When was the original trip to the desert [inaud]?*
Which original trip?

_The one you mentioned where you’d scuba dived and then – from the Red Sea, I was just …_

Ah yes, ah … just after my wife died I should think, ’92, ’93 something about that, that area. ‘Cause I’d been diving before she died, been on diving trips there and she’d come on some of them. So we’ve now got to the time where I’d done trips with Andras Zboray into the desert. We were going down to Sudan but then Sudan blew up and all this Darfur business came on and so that put an end to that. So I then had – well I’d already met two very interesting people, Kit Constable Maxwell who has this smashing Land Rover for going into deserts and that woman there on the left there who’s called Hannah McKeand who’s the fastest woman to the south pole un – unsupported. And some woman, really believe me. Not butch at all, lovely female, pleasant character, but as tough as old boots, she really is and – and a lovely woman too. So anything having said all that I then start to plan a – a number of trips into the Egyptian desert and the Libyan desert and the Algerian desert with … Kit Constable Maxwell and this – hence this trip I did with the fastest man in the world, Noble and so – so forth where we were following the Long Range Desert Group – route across Libya which is a long story and I won’t go into but it’s a grand – through the great Sand Sea, excellent, worked well. So that’s that. But also at the same time my next door neighbour … Daphne Dormer, had been a … tour guide – no, technical expert on tours, upmarket tours to Oman where there’s lots of desert things, and … my son-in-law Gerry who was a Rolls Royce engineer and – moved from there to Paxman Diesels which go into ships, had a customer in Oman, ‘Can I carry your bag?’ ‘Yes you can,’ so I had a – and he couldn’t devote all his time so I had a trip round the Jebel Akhdar Mountains in – in Oman and the – oh lovely, grand. And then having done that I – this lady, Phillipa Treadwell who – was introduced me – to me by Daphne Dormer next door, she also travelled in the Himalayas, so I started a series of travels with her in the Himalayas and her friend Susie Raye, where we went to Ladakh, Leh … what’s it called? Muscat, Muscat, yeah, not Muscat, that’s somewhere quite else, there’s a – oh dear oh dear, there’s a … there’s a – a – a little state over the other side of the Himalayas, behind Annapurna and Dalgieri, it’ll come
back, Mustang, Lo Mantang, Lo Mantang is the town, Mustang is the place, that was brilliant. Had a jolly good sherpa guide who – who did these trips for us. Then we did other trips into the Himalayas, we went to Leh, we went to various valleys on the Sutledge and so forth, so a whole lot of trips there. And then following that, I recently, five years ago did a trip to the Wakhan Corridor in Afghanistan which was great, to try and find the source of the Oxus, that’s between Pakistan and Tajikistan, if you can imagine, no you can’t, Afghanistan has a bit up north which sticks out to the east, the Wakhan Corridor, it’s about fifty miles long and follows the Oxus route and was a overhang of the British Raj, who was not fighting physically, but jolly nearly, the Russians that were coming down from the north to get the jewel in the crown. And so eventually it was decided in Curzon’s time that there should be a cordon sanitaire between British India and Russia in the – in the – in the Pamir Mountains, so the – they got hold of the Emir of Pakistan, sorry of Afghanistan and said, ‘We’re going to give you this piece of and to separate this,’ and he said, ‘But I don’t want it, I’ve got enough trouble,’ ‘You’re having it,’ so [both laugh] he was – he was given this long strip of land which separates the Russians from the Brits, it now separates the Tajiks from the Pakistanis of course, the world’s changed. So I went there, that was grand.

*I can’t help but notice that Afghanistan five years ago is – is still the war zone it is now.*

Oh absolutely, it was pretty bad then. I remember landing – a lot of stories, landing at Kabul Airport and all over Kabul Airport the little piles of stones, three of them, one two three, painted white just all over there and I said, ‘What are those?’ ‘Oh that’s where we found bombs,’ [laughs] and there were still chaps going around the aerodrome with these … detectors. And these great big modern jets were zooming along the runway through this lot, it is fun. And then of course red painted rocks when you go up into the mountains where they haven’t swept the things yet. Things blown up all over the place, yeah, it’s one hell of a country, it’s a basket case and what the hell we’re doing there I don’t know.

*[Laughs]*.
Yeah, especially my granddaughter, but there we are.

[34:17]

We’ve got about ten minutes left, I’d just like to ask you some closing questions.

Yeah sure.

What do you think have been the high points of your career if you had to list them, the things you’re –

High points of my career, you mean from personal satisfaction or career points?

Well I think both but if you –

Right, well I think both must be the design of the computer, the HEC machine, that must be the high point of my career, yes, definitely. Yeah. It’s interesting, I was on top – number one on top of a very small pinnacle, then the pinnacles grew and I was down a bit until eventually there was this great range of mountains that I had nothing to do and I was down below, if you’re with me, the world just moved on, yeah. Also I’m – I’m not a man that likes being a manager, I like doing things, and be involved, yeah.

Are there any colleagues along the way who you think have been influential on you?

Oh many many many. Many.

If you had to pick one or two particular ones?

… Strangely enough, not – not one person shouts particularly. I met many very fine people along the way, yes. But not one that was absolutely crucial to my development. And strangely enough, I was thinking the other day, out of all the people I’ve met there’s only two that I really hate their guts, which is quite
remarkable when you think of the tens of thousands of people I must have met. And I’m not going to tell you who they were and what they are, no.

*I’ll mute it for thirty years.*

No. [both laugh]

[36:05]

*How have you felt about doing this interview, I know you had some reluctance when we first spoke on the phone.*

Well I think the reluctance is still there. I – I’ve enjoyed it and it’s been an ego trip and that’s been grand, but – and it’s also refreshed my memory, that’s another very interesting thing. But what good it’ll do to posterity I have the greatest doubt that it probably hardly ever be looked at again or not, I just can’t see why it should be. But it – from your point of view, jobs for the boys, very happy, and if you want to scrub that out for thirty years you can. [both laugh]

*How have you actually found the interviews themselves as –*

Yes, I’ve – great – great fun because it’s made me think and it’s tried – made me crystallise certain attitudes and thoughts on things. Though whether I have actually changed anything, I think at my age you don’t actually change very much, it’s – you’re pretty set by my age. Now perhaps you can tell me something; you’ve interviewed ten, twenty other people in my age bracket, where do I fit into the – into the – and now be honest, don’t – first of all under – what’s the word I want, ability to memorise, to remember –

*My feeling throughout this interview has been that you’ve got a good – a good memory for someone of your age.*

Someone of your age, now that’s interesting. So you think that people younger would have a better memory?
No, that’s just the question that you asked me though –

Yes it was.

People in your age bracket, I’m –

Yes true true true, yes. [laughs]

And I shouldn’t say any more because of, you know, the other people involved I should think, but I’ve been struck by the quality of your memory on a number of occasions.

Okay, right.

Who have you told –

Do I sell – tell consistent lies? Have you ever – do I say different things one time and –

Is there consistency in your – in your story?

Yes, I –

Yes, yes there is.

Right, that’s good, okay.

There is.

Right.

Who have you actually told about this interview, if anyone?
Oh I just mentioned it to – to my children who smile and say, ‘Poor old lad.’ What else? No, that’s about that, nobody else in particular … that’s about that … I am disappointed because we have not allied photographs to this and a visual thing is so much more dynamic than just words, I could see that when you looked at the photograph there.

_Hmm._

Secondly … as I’ve said before I don’t know what use anybody will make of this but okay it’s – it’s, you know, it’s fun and some – it’ll go onto the archive somewhere, and I’m sure there are massive archives elsewhere that nobody is looking at, must be.

_I think one of the key things about our archive is we intend it to be used and we’re putting the mechanisms in place for that to happen._

Really, such as?

_Such as, well that will partly depend on what you sign up to in the paperwork._

Oh.

_In terms of universities and in the future other people around the world being able to access this._

Right, okay.

_Ultimately we’re hoping for a web presence that people all over the place will be able to access to different degrees._

_Hmmmm hmm._

_And something that will actually be used rather than just sit there like so many academic interviews, something that will be accessible to people._
Well I was going to say that … England is not the centre of the world, what else is happening in America or Australia or Germany or, you know, is the same thing happening there?

I think the Americans have been doing this thing for a lot longer than us in terms of this sort of project, though – I think one of the sub aims really is that, you know, that there hasn’t been the same consistent effort to talk to British scientists that the Americans have been doing for decades.

I – America’s – for decades have been going out there with a wad of dollars and buying the archives of various famous people, which I think is brilliant. I mean I may feel very upset that they’re coming and buying – it may be an artist archive, it may be a scientific archive, but certainly authors, they – anything that’s scribbled on a bit of paper by an author they’ll buy, so all that’s going into some store somewhere. I’m – I just don’t know, I –

How do you feel about –

I – all – think it’s help – it’s home – what’s the word I want, it’s not going to upset anybody, I think it’s fairly harmless derangement.

[Both laugh] Lost my question now.

[Laughs] I’m sure, yeah [both laugh]. No.

How do you – how do you feel about the way that computer history, you know, your particular field is treated in Britain?

I haven’t given that much thought. I’m pleased that I am the age I am because all the other people that are grinding axes on – who was first and who did what are dead, so that’s [laughs] – that gives me some – what’s the, last man standing advantage, yes, yes. Yes.

Hmmm.
Because I mean there is animosity between computer developers just the same as there is in any other sphere. I mean Doc Booth was particularly … I was going to use the word aggressive but he – he believed very strongly that what he’d done – did was the first and the best and all the others came after and, yeah. Brilliant man Booth, the last word I – I would leave on that tape was that I think Booth was jolly nearly a genius.

... I think we’re just about done.

Jolly good.

Just one – my final final question though is –

Yes yes yes.

So how have you felt about taking part in this project as a whole?

Oh I’ve enjoyed it, very much so yes yes yes … I – having looked at that transcript that you’ve got there which – not transcript, summary sheets, behind that will be the actual transcripts of what’s going on here, which as you say will be ten times as big, the mind just boggles as to how that is ever going to be used, but anyway there we are. I will wait and see what posterity does with it. Right.

Any final words before I press the stop button.

Thank you very much. [laughs]

Thank you Ray, it’s been a pleasure.

[End of Track 15]