NATIONAL LIFE STORIES

AN ORAL HISTORY OF BRITISH SCIENCE

Raymond Wheeler

Interviewed by Dr Thomas Lean

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<td><strong>Occupation:</strong></td>
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This is an interview with Ray Wheeler 19th October 2010. Ray, I’d just like to start by asking you some basic questions about your childhood really.

Yes, no problem with that.

When –?

Sorry?

When were you born and where?

I was born on October 25th 1927, and my first motorcar was the same vintage [laughs]. An Austin Seven Chummy.

Where were you born?

And I was born in the hospital of the Middlesex regiment, er, in London.

What did your parents do? What were your parents’ names to begin with actually?

Well, my father was Edmund Francis Wheeler and my mother was Ivy Geraldine Friar. Both were islanders, born on the island.

The Isle of Wight then?

The Isle of Wight, yes, sorry [both laugh].

What did your parents do?

Well, my father – both my mother and my father were born in 1900 and when he was fourteen the First World War started and he volunteered for the army, as a boy. Hmmm … do you want me to –?
Yes, please continue.

Okay. The – my mother was born in East Cowes and she became a school teacher in West Cowes. And they married in, I think it was, 1923. Just a second, I can check that. I find these pages, the fact that they’re printed like this, they don’t want to let you see the printed page. Yes, 1923. Er, my father was in the Royal Corps of Signals and by that time he was a sergeant and they – I’m just trying to think where he was first stationed. I don’t know is the answer to that. He [telephone rings] – [break in recording]

[03:10]

So did your father actually – was he actually involved in combat in the First World War?

No, he was due to go to France in 1918 and they never went. He was actually about to sail, well, they didn’t go, so he never did serve in – and by the time he was thirty-five he’d done his twenty-one years’ service and he wanted to help to convert prisoners to a normal way of life. He was dissatisfied with his army life, I imagine in 1935 after twenty-one years he wanted to do something else, but unfortunately he was posted to Parkhurst Prison of all prisons where there was – the long term prisoners were held, so the possibility of him reforming them was almost nothing. And, er, I even experienced it myself as a boy of sixteen or so, the – I played cricket with the senior prison team and there was a prisoner who looked after the pavilion and did the teas for the teams and things like that, and he came to me one day. He talked to me a lot because I was available to be talked to so to speak ‘cause all the men were talking to one another, so I heard a lot from him of his life and what have you. And he said he was going to – he was going to be, I’ve forgotten what the term is for – anyway, leaving the prison and how glad he was to be out, and two months later he was back in again. He’d done something deliberately to get back into prison, so I can well imagine my father got very, er, disillusioned with his job.

Can you describe your father to me?
Well, he was a great sportsman. He, er, was a superb centre forward and the Sunderland football team wanted to buy him out of the army but there was no security or anything in football in those days, so he declined. And he was extremely good at cricket as well, and we used to play night after night, he and I, my brother wasn’t quite so keen. And, er … he was a real gentleman in terms of his behaviour and how he spoke to people, and he was a big example to me, I missed him dreadfully when he died. But, er, there we are, that’s life isn’t it? Why do we always say that? It’s life when it isn’t, it’s the opposite [laughs]. Silly really, as an expression isn’t it? Anyway, no, he was a great dad and I owe a lot to the way I treat people to the way he treated me, and the way I saw him treat other people.

*Could you give me any examples of that? Are there any sort of, you know, early memories that stick in your mind along those lines?*

No, I found it more of a general almost day to day thing that I’m talking about. When he met people when he was playing cricket and talked to his mates on the field, and neighbours. You know, we lived in flats so we had neighbour problems and he was always the gentleman and yet he was never higher than a police sergeant – a company sergeant major. So the army must teach men in the army a lot about how to live together, must do, and that really rubbed off on him. But he died when he was sixty-nine. He was a smoker which of course in their day it was a social habit, you know, you smoked together as a communal thing. It wasn’t just that you had a smoke because you wanted to smoke because of what it did to you, you smoked because you were with other people smoking. And I shall never forget, we were living in East Cowes here at the time and, er, you could buy a pair – a packet of cigarettes from a slot machine on the – out in the street on a wall. You put two old pence in and got a packet of five Woodbines, and my brother and I got hold of a packet with a cousin of mine and we went up the river and got in the bows of an old hulk and started to puff away at these things. And I couldn’t stand it, I coughed, I spluttered, my eyes ran. I went home, and this shows you how good the relationship was with my dad. I said to him, ‘Dad, why do you smoke?’ I said, ‘We’ve just been down with a pack,’ [laughs] I said, ‘and it was horrible.’ I said, ‘I’d sooner stick my head in a bonfire than smoke that’ and he said, ‘Oh, good.’ And that was the end of that. I wasn’t told off or
anything, he knew I’d learnt my lesson and I haven’t smoked since. It cured me of ever doing it, I still to this day don’t understand why people smoke, so we were good friends, my dad and I.

[10:15]

*Do you think you’ve inherited any traits from him?*

Oh, that way of dealing with people, oh yes. I learnt that at a very early age and that’s gone with me throughout my life. I never confront people ever, it’s not – it’s not on and you don’t need to.

*How did he expect you to behave when you were growing up?*

How did he expect me to behave? Erm, only you had to stand tall, that’s what I would remember most of, what he had to say to me, you – you stood tall in life. And I can remember when I passed the scholarship to – am I jumping now?

*Don’t worry about it.*

I, er, went to, believe it or not, Parkhurst Primary School which throughout my life I’ve delighted in saying that I was educated at Parkhurst Primary School [laughs]. They’ve changed the name now, it’s Hunnyhill Primary School, but I passed the scholarship and I was the only one who did. And primary school in those days, you left when you were fourteen, and I was in the top class because it was a small school, not because I was particularly brilliant, ‘cause I wasn’t. And I was the only one to pass the scholarship at eleven and it was then called the Eleven Plus of course. And so all the other boys were condemned to that same class until – for another three years and so anybody who passed was automatically bullied. And my mother came to the school to see if I was being bullied and found me at the school gate with them jumping on me, and went immediately to the head in the school who said, ‘It’s outside the school gate, nothing to do with me.’ And so she took me home and the boys of course had run away when she hove in sight, and dad had me trained to box from a local bantam weight champion boxer who happened to be a police – a bus inspector.
And he taught me how to box and he taught me that you – in the boxing ring you always got in first and, er, so I got in first to these – these lads and plucked up my courage and did it, and sure enough it cured it and I didn’t get it any more. So that’s the kind of way my father looked after me and what he meant by you stand tall. And he never seemed to worry, and I don’t, I don’t worry either. You’ve heard Jean already say that and, er, it’s no good, I’m always – if there’s a problem it’s not why did it happen, what’s – who did it or anything, that’s never bothered me. What always bothers me is what is it you’re going to do about it, you know, the – you can do all the – find out the cause and all the rest of it and do something about that later on but at the time all you need is what is it we’re going to do about the problem, and I’ve got that from him without a doubt. And my mum, I mean she was a super mum, she really looked after us.

[14:29]

Can you describe your mother to me?

Well, I think she was a very good looking lady and, as I say, she was a school teacher. And at home she was in charge, she was the boss, and she was the one who encouraged me to read. She encouraged me to read Dumas novels and I read practically all of those by the time I was about thirteen or fourteen. And I can remember going back a bit when at one start my father was stationed at Catterick camp in Yorkshire and, er, I used to play truant. And she once, when she found out, she escorted me to school from behind with a long flexible stick, hitting the backs of my legs the whole way to school [laughs] right into the playground. But I did – I did find primary school so boring, absolutely boring. I didn’t really enjoy school until I was in the sixth form and then I did enjoy at school. At that time I was a school sports captain, which helped, but learning physics, maths and geography suited me down to the ground in the sixth form.

And your mother was a teacher as well.

Primary teacher. She taught at West Cowes but like all the ladies at that time, when they got married they – they gave it up and I think that was terrible. It’s not necessary
either but, er, she didn’t seem to mind but she did encourage us in terms of learning and are you doing your homework and all that sort of stuff. And she too was a disciplinarian, which she had learnt at college, and so we – we were almost, when we went out for walks, which we did, we walked all over the place and bicycled together and sang round the piano together. We did a lot of family things together and, er … I’ve lost my way. What the hell was I going to say? Hmmm … yes, she … damn, I’ve completely lost my train of thought.

You started off by saying she was a disciplinarian.

Yes, I was – oh, yes, it was almost a fact of when we – before we left to go out somewhere it was almost you stood in a row and [laughs] you were inspected as to whether you were dressed properly and had your shoes clean and that sort of thing. And we – when we went they were always in sight of us, they were – we were never – it wasn’t that we were not allowed to go out of sight, it was that they kept in sight of us.

[18:42]

And we had a wonderful Alsatian when we were around about ten, plus or minus. He’d been rejected by the army, they couldn’t make him fierce, they couldn’t make him go for anything, and they were supposed to be destroyed I understand but somehow dad managed to get this one out and we’d play hide and seek with him and all sorts of things. Incredible dog he was, and you learn a lot from having an animal that you’ve got to look after and … and understand. I learnt an enormous amount from that Alsatian and so we’ve always had dogs, we haven’t got them ’cause of all sorts of problems but we have throughout our life had a dog until recently.

What was the Alsatian’s name?

Peter.

What sort of responsibilities do you get with having a dog?
Well, I – for instance, you take him for a walk and another dog comes along and wants to have a fight, you’ve got to sort it out. They’ve got that sort of thing at one end of the scale, the other end of the scale was we would have up to twelve or fifteen boys and girls together and we’d scatter and hide and he’d find them all, even if he hadn’t see some of them that day, until that day, he’d still find them. And I used to find that absolutely incredible. I’ve always had a tremendous respect for animals since then and what they’re capable of, and I do think that’s one of the things we do underestimate. And, you know, seeing – for instance, in our zoo here on the island, the chap, he’s died recently, but he had tigers there and he would play with them. Now how does that happen? How has that chap got into that tiger’s brain that he loves him and the tiger has responded somehow? Now there’s something more in them isn’t there that we’re still – we know not what it is. But that Alsatian taught me that all those years ago.

*Did you have any other pets?*

Yes, I used to keep rabbits. I had one as a pet but I used to breed them because of war time, we used to eat them. I hated killing them, I really did hate it, but we had to do it and then we skinned it. I skinned them and Mum had them cured and made gloves and gloves for us and things like that, so – but I did have these rabbits and there was one that was special [laughs]. I went out to it one morning, how old was I, fourteen or fifteen I guess, and there was the rabbit and alongside it, between it and the wall of the cage all cuddled up together, was a bloody great rat [laughs]. So I opened the cage and the rat got out and disappeared down a hole, and our house was on the side of a hill so there was a – a drop from our garden to the next door’s garden and they had chickens. And so Dad and I cleared all the cages away and dug down and we got right down to the chickens and there were all these rats which we clobbered with a great big stick. He dug them out and I clobbered them [laughs] so we didn’t have them any more but, er, that was a horrible shock but apart from that, no, I enjoyed having rabbits. And we had – the back of the house was an enclosed, we called it a yard, but it was probably about the size of this area we’re sitting in now.

*How big’s that for the benefit of the tape?*
Well, it’s sort of twenty feet by twenty feet, it might have been a bit more than that, so perhaps twenty-five feet, twenty to twenty-five feet. And gate, all solid gates, so I could let these rabbits free to run about and chase, and they’d play with one another and quite enjoyed that.

[24:18]

_Could you actually describe this house to me that you were living in?_  

It was – yes, it was a, what we used to call, three up and three down. Had a lounge, living room, and in those days you would always have what we would call a front room which was the posh room you didn’t go into except when you had visitors. And that was never quite as big as the big living room, living dining room, and then a kitchen, no bathroom. You had a bath and over the top of it a great big solid table that you put back up against the wall when you had a bath. And, er, you washed and so on in the kitchen sink. And then upstairs there were three bedrooms, my sister had one room and Mum and Dad had a room, and my brother and I had a room. And it was on the road from Newport to West Cowes and looked across the River Medina towards the sort of south west. And I can remember vividly when I was taking rehearsals for higher school certificate and they’d started the flying bombs and they were – they come right over our house towards the New Forest. I presume they thought, and I presume there were, troops in the – in the forest. And they were – they were just left alone, they – because if you brought them down you didn’t know where they were going to go and eventually a chap who later became the chairman of the company I was with, which I’ll come to later, he was one of the people who developed the technique for flying underneath them and tipping them over, tipping the wing over, so they just went down into the sea or ground. And they tried to do that before they got to England, or got over an area where they wouldn’t hurt going down. But anyway, you’d watch these things coming and you’d see this – the rings of fire ‘cause it was a sort of pop-pop-pop-pop-pop-popping sort of noise ‘cause it was – I forget what the engines were called but they –  

_Pulse jet?_
Pardon?

Pulse jet?

Well, it’s sort of a pulse jet. It just had a chamber that was filled with gas and the oxygen and then intermittently fired, so you just got this pop-pop-popping noise and you could see these rings of, smoke rings, coloured by the flame that was coming out. And so you’d see this thing coming at you, pop-pop-pop-pop, and we would watch them coming and when they got up to sort of forty-five degrees we’d dive under the bed and wait for the engine to stop [laughs] but it never did, they all went over the top of us. And then they tried to knock them down in the Solent and so on, ‘cause they were quite low level. Whilst I’m on the subject of the N1s the – er, sorry, the V1s, the – we were not allowed off the island during the war. You had to have a letter to show that a near and dear relative was terminally ill or died or something drastic before you were allowed off the island. And then in 1944 they began to relax a bit and the school decided that – and they got permission that we could go to London because the air raids had died down and we were getting almost as many – what little few air raids there were, there were almost here anyway. And so we tanked off to a big schools’ conference on town and country planning in London, and I don’t remember whether it was the first or second night, there was this enormous explosion not far from us followed by a noise like an express train that turned out to be the first V2. So they’d safeguarded us all through the war and then sent us to London to be greeted by the first V2 [laughs]. But I’ve digressed again.

[29:45]

Yes, so you were actually born in London then originally?

Yes, I know I was conceived on the island, so I count myself as an islander and I know the actual room in which I was conceived [laughs] in my grandparents’ house because dad was on six – he’d been to India and he was home on six months’ leave. And I know they spent it on the island with my grandparents, and I know which bedroom they had ‘cause we – it wasn’t until much later that my grandparents vacated that lovely big house here in the town. And there was only one other decent bedroom
other than the ones that my grandparents had, so I know exactly where I was conceived [laughs] but then before the nine months was up they were up in London.

*So where did you actually grow up at first?*

Er, well, I spent a few years at Mill Hill barracks, three, which I remember almost nothing. And then we were shipped off to – what’s that little county that don’t – no longer exists in the middle of the country? I’ve forgotten its name. We only stayed there three months and then went on to Catterick camp which we thoroughly enjoyed, Catterick camp. The River Swale was nearby, that was a fantastically beautiful river, and the moors, collecting huge mushrooms the size of dinner plates and all sorts of things, and we thoroughly enjoyed that. And places like Richmond were within a short distance. We used to spend our summer holidays at Redcar, er, and I’m talking now from roughly 1930 to 1935.

*Where did you actually live in Catterick?*

In one of the army, er, what do they call them, houses but there’s a term for army houses and I’ve forgotten it. And they were – the ones we were in were bungalows and it was the same sort of thing, you had – but there we didn’t – we didn’t have a front room, we had a lounge and a big kitchen/dining room, and three bedrooms. And again no bathroom and the loo was outside side, which could be bloody cold going to the loo in the winter [both laugh].

*What was the surrounding area like?*

Beautiful, beautiful countryside, yes, very nice indeed. We thoroughly enjoyed it and when – in 1935 when Dad resigned his army career we were furious we were being taken down to the Isle of Wight. We didn’t want to go to the Isle of Wight, we liked it here and we wanted to stay put, but I guess that’s children isn’t it? Home is home wherever it is and you don’t want to leave it I guess but nevertheless we did thoroughly enjoy the Yorkshire moors and the River Swale and Richmond and Redcar.
And then you moved to the house you described on the Isle of Wight, or?

Yes, yes. Well, we had a flat at first but they were very big and very nice, and then we moved into the house. Still there, but the flats are not, they’ve been destroyed, well, pulled down. The prison expanded to where they were but the sports – the sports field which was right outside the front door, we would be playing football and cricket in the dark, shouting at one another to – you know, night after night we played.

Why did your father actually decide to enter the prison service?

Well, ‘cause he thought he could reform prisoners. He thought he could do some really worthwhile work.

Have you any idea where that, you know, idea came from?

No, no, that was 1935, I was, what, eight. That was a complete surprise to us that he made that decision. He regretted it quite quickly and then of course the war came and he tried his best to get back in the army, but try as he would they wouldn’t let him go back, reserved occupation, which I suffered from lately – later, which I’ll tell you about in a minute.

You mentioned one of two or your father’s interest in passing of the sport, I was wondering what else did he do.

What, in his spare time?

Yeah.

He was a superb gardener, vegetable gardener, and he had two big allotments. And almost all our vegetables were grown by him. But, no, he didn’t – he was very keen on forecasting football results [laughs], the pools and so on. He spent quite a bit of time at that but, no, he didn’t – it was gardening, he spent all his spare time on these
two big gardens. He read a bit, hmmm, and we played cards, he taught me cribbage, we used to play cribbage a lot, which is quite an interesting game, cribbage. If you’ve never played it I can recommend cribbage.

*Why do you find it interesting?*

Well, because it’s not all, hmmm, the good fortune of the cards you get, it’s how you play those cards can – contributes a great deal to whether you succeed or not. And you have to be able to add up quickly and things like that. Very educational it is, cribbage, and enjoyable, we played it an awful lot.

*Who else with?*

My brother and my father and I. Not Mum, she didn’t, she didn’t play, she was always busy mending and making do and all those things that women used to do. And in fact Jean, my wife, did when the kids were small, exactly the same.

*What sort of things interested your mother?*

Well, she was interested in the flower side of gardening and she did a lot of that, but she did a lot of sewing and making things, clothes and that sort of thing. She was always doing something of that sort, mending, er, and she made a lot of my sister’s clothes. And I shall never forget, this was a very common thing in the war time because of course clothing was rationed, and she – she knitted a bathing costume for me and I [laughs] went into the sea and swam about a bit. And it was – you know, no shorts, it was like the men’s bathing costumes were in the ‘60s, it was still the same, you know, there’s no leg at all. And so she made this and I went into the sea and I came out, and straight away it gradually went down to my knees [laughs]. So that was the end of knitted bathing costumes [laughs].

*Was it wool or –?*

Wool, yes [both laugh].
Do you think you inherited anything from your mother?

Oh, er …

Nature or nature, so –

No, I hope I did inherit her nature, I’m sure I did, and that combined with my father has stood me in good stead, I think, as a person, and I certainly learnt that from her.

Her nature, could you describe that?

… She was a very pleasant lady, she – I can’t remember her losing her temper. She would persuade you to do things rather than – she would tell you to do it and then she’d tell you why, and always reason was used. And she was just a nice lady.

Did your parents have any particular political outlook?

No, they didn’t, no. I would say my father was a strong conservative but it never came out, that’s just me thinking how he would have thought. He wasn’t political at all, hmmm, but he was very much if the government says you do it, you do it, and I think that probably came from his army training ‘cause starting off at the age of fourteen, you know, that’s got to be instilled into you hasn’t it, by the very nature of what you’re doing.

What about your mother?

Sorry, what?

Your mother, did she have any outlook on life?

On politics, no, not in the slightest. She was too busy living to be worried about politics, but I would say that she’d have been a Liberal had she been anything. Later
on perhaps she was a bit more interested but she kept it to herself, she didn’t bother to talk about it at all, not politics.

Did they take a paper?

Oh, yes, Daily Mail. Oh, yes, they always had the Daily Mail, yes, which in those days was quite a good paper. I used to always be looking at what the war was up to ‘cause that was an important period of my life was the – from eleven to, hmmm, seventeen I suppose. It’s a little bit longer than the war isn’t it? But that period of my life, sorry half a year off each end of it, was the war and I used to devour the Daily Mail, especially the battles that were going on and the aircraft that were flying and all that sort of thing.

Was there any particular part of it that interested you?

Any?

Any particular aspect or …

No, how – how the battles went and who – who was doing what, especially the North African campaigns. They were very, very interesting and when Rommel came on the scene and all that sort of thing, and I followed that avidly. Of course all the air battles were always going on over the top of us. I can remember vividly we cycled down to West Cowes with – we were living, excuse me, five miles away at Parkhurst and we cycled down to Cowes on around the front and we watched a boat being dive bombed in the Solent. And they were, er, firing AA shells at it and we could see the – the shrapnel from the breaking of the shells slipping down into the water, and so we knocked on the door of a great big house down on the front and asked if we could come in because of all this shrapnel coming down. And we were taken in, and er, we stayed inside and we could watch it going down into the lawn [coughs], amazing really.

[44:34]
So I – well, one of the things that I did get out of my father was I was never afraid to talk to anybody and so I marched into the office of the chief education officer in the county hall at Newport aged eleven and asked him could he help me to have a room somewhere to form a spotters’ club, which was an organisation at that time that encouraged spotting aeroplanes from silhouettes. And you had – you had, I’m trying to not use the word examinations, tests I suppose was a better word, and you were supposed to get a very high percentage of results to become a member. And I formed this spotters’ club and the headmaster helped with projection equipment and slides and things, and we had meetings in the school assembly hall and gradually the men who joined the club took it over and it thrived during the war. And so that was a big interest, and that was very difficult, very difficult, you – a silhouette from any angle would be put up on the screen and these slides were supplied by the spotters’ club and you’d have to say what aircraft it was and score a very high percentage.

What happened if you did score a high percentage?

Oh, no, you just – I remember you got a bit of [applauds] clapping but that’s about it [laughs]. No, there was no – we had no membership fee, nothing. I mean pocket money for school boys was pennies, we were lucky with that. If you got five pence a week you were lucky.

Is that what you got?

Er, I remember early on when we were in Catterick it was two pennies and I think the most it went up to was five.

What does one spend one’s pocket money on at this time?

Sweets of course. They were rationed but you could get something in the – it didn’t go very far, two pence or a five pence, whatever it was, but it was mainly sweets that you spent that on.

Did you see much else of the war?
Much else of the war from –? Well, hmmm, this island was often used as a navigation point and so if there was say an air raid on Manchester the aircraft would fly home to the Isle of Wight and then off in whatever direction, avoiding the intense anti-aircraft facilities of Kent and Sussex. And if they hadn’t unloaded their bombs, if they’d been turned back, they’d drop – particularly incendiaries, they’d drop them on the island and if you went onto the Downs in the morning you’d find all these little eighteen inch circles of white magnesium oxide powder where it’d exploded. And occasionally they’d hit or cow or some other – which wasn’t very nice but that was very rare. And then of course there was the big Cowes raid and, er, by this – by the time, that year, 1942, my brother had become an apprentice at Saunders-Roe and about a week before the big night time Cowes raid he and another were at the front door just about to leave and a – now what did they used to call them? An aircraft looking at what was to be bombed was coming back from looking at Cowes at low level and fired machine guns at them, and, er, it was – it missed them by about three feet. But I had heard this aircraft go to Cowes, got up ‘cause it was seven o’clock in the morning or something like that [coughs], and I was at the window looking to see where this aircraft had gone. And it came back and some of the bullets that were fired at Mum and Francis went under my window, and there were five holes that much below the sill of my window I was looking out of, and there was this horrendous noise, indescribable noise, of these cannon shells and bullets hitting the building. And everything went red from the dust of the bricks, and I can remember vividly, you know [laughs] whether I’d been hurt or not, and there was such an overwhelming thing. I thought I was dead, was quite convinced I was dead. And – but I never saw the aeroplane [inaud]. And then a week later they – they really did bomb Cowes and in spite of what people say about it was indiscriminate, the raid on Cowes was definitely not indiscriminate. I mean they really hit the manufacturing, they – some of them missed and caused casualties but you couldn’t really say they’d bombed the town; they bombed the industry and hit the industry. And incidentally, that gave me a problem because Sam Saunders, the Saunders of Saunders-Roe, had moved from the Thames down to East Cowes and later formed Saunders-Roe, and up river from the aircraft facilities his boatyard still was running. And they hit that for six, not completely destroyed that, and with it went all the company records going back to the mid eighteenth, sorry nineteenth, century, so I had a hell of a job later in life to find out – to research that history. Anyway, so they – they really hit the – hit the town and
we – we were five miles away and when the first raid went we stayed in our flat and then when it came again we went into the air raid shelter. And I can remember vividly these little benches we were sitting on in the air raid shelter moving with the bombing and the anti-aircraft guns, the continual vibration of these little … I don’t know what you call them, benches, bench seats.

[53:33]

And anyway, when it got to daylight my brother and I got on our bicycles and came to East Cowes to see how our grandparents were because they lived in the middle of the town. And certainly a bomb had fallen fifty yards away from them, in fact we – we couldn’t wake them, we couldn’t get in, and we were very worried and we tried to get in a window and the police were patrolling the town to stop looting and we were arrested [laughs]. And we pleaded that, you know, it was our grandparents’ house and that we were trying to – we were worried about them and we wanted to get in and fortunately some neighbours came along and identified us and they let us go. And we got back home to find that our grandparents had got a taxi and gone and they were at home [laughs]. We’d passed each other on the way. But prior to us – this town has really one main street, one main road, out of it and that was blocked by the police. We had to talk our way in, to the town, to go to the grandparents’ house so, you know, security descended pretty smartly on the town, which must have been very well organised.

Was your grandparents’ house all right?

Yes, yes, not even a window broken, but the bomb – opposite them was the Methodist church and then below that, down towards the river, was a row of houses with its air raid shelter. And some of – granpy was the manager of Bradings, a big building company in the town, and one of his employees had played the violin with Mum, and when they were young they used to give concerts all over the island, him playing the violin and Mum singing. And he was away, called up, but his wife and family were all killed. They had an air raid shelter there and they’d all gone – like us they’d spent the first raid under the stairs, second raid they thought they’d better go to the air raid
shelter, direct hit on that air raid shelter, so he lost all his family. And that was fifty yards away, I guess, from granpy’s house, so –

[56:33]

Are these your maternal grandparents or paternal?

Maternal. Yes, my paternal grandparents, the Wheelers on the – there is a lot of Wheelers on the island, mainly to the south of the island, and a lot of them were reportedly smugglers in previous generations. How true that is, I don’t know, but I think it probably was, simply because of where they lived. But, no, my paternal grandfather had come to the island in the First World War and – or before the First World War, it must have been because – because Dad was born on the island so he must have been here when – anyway, he maintained the army boats out at Fort Victoria which is an old Palmerston fort, er, to the west of Yarmouth, and he maintained their boats there and, er, so …

Did you see much of them when you were growing up?

Yes, yes, ‘cause they – they lived probably a mile away from us, Dad’s parents, but they’re Bristol – they’re a Bristol family, they used to have a – run a black cab company, I think it was called, in the centre of Bristol and that would be my great, great grandfather I suppose was shown as a vet, which apparently somebody was always called the vet in a cab company.

[End of Track 1]
We were talking about your paternal grandfather. What was his name?

Sidney Wheeler, I don’t – can’t remember his other name.

Mrs Wheeler: maternal?.

Sorry?

Mrs Wheeler: Maternal.

Paternal.

Mrs Wheeler: Oh, paternal.

Look, you’d better be quiet woman [both laugh].

Mrs Wheeler: Sorry.

He was Sidney Wheeler and, er, I think I have already said that he was – came to the island to look after the army’s motorbikes at Fort Victoria [telephone rings], yes, Fort Victoria. And he like the Isle of Wight and married an Isle of Wight lady born in the workhouse at Newport as it happens, but she was a very nice lady and they stayed on the island. And, er, he went to work at Saunders-Roe after the First World War and stayed there the rest of his life, and he left Saunders-Roe almost to the day that I joined as an apprentice. And, er, he – he was a very self contained man, always sort of smiling, big man, sideways and vertically, and he had a slight, oh what do you call it? Not vibration …

Stammer?

No, of his arm.
Tremor?

Tremor of his arm. And, er, this big smile on his face and this steady movement of his arm. We used to go to one of my father’s sisters frequently for tea and afterwards we’d play a card game called brag where you were – you had to say what was in your hand and you could – that’s where the word brag came from, you could brag about what you had in his hand – in your hand. And he would play this game and he’d always be one of the winners or nearly winners and it was so amusing to see him there with this steady smile on his face and this arm going steadily up and down and you hadn’t a clue what he had in his hand [laughs]. But no, he was a lovely old man, he lived till he was 80. I didn’t see much of him, we didn’t visit him that often, we were so busy ourselves but we did – we did visit them though, several times a year, as we did our paternal grandparents. He was a toolmaker at Saunders-Roe.

[03:30]

This was your paternal grandfather?

My paternal grandfather.

Right. What was your paternal grandmother like?

She was a little tiny lady, er, who was almost scared of being with everybody else. She would sort of try and stay in the kitchen rather than come out and be with the family and I often wonder in retrospect if this was just the tough upbringing she’d had in the workhouse perhaps. But she was a nice lady and she was obviously a good mum and – but we didn’t really know her very well, she sort of kept out of things. There’s an amusing sequel to this when my brother, later on when he left the air force to marry a Canadian girl and, hmmm, lived in Canada for most of his life after he left the air force, and he asked me to get all the birth certificates and death certificates and so on of anybody in the family that died. And when granpy died, after – sorry, paternal granpy died, and paternal granny had died not long before, I was trying to get their birth and death certificates and he’d died at the house of one of my father’s sisters who’d been looking after him and who was a devout Catholic. And I was – I
found I was very obstructed by this sister, Auntie Dot we called her, over Granny’s birth certificate and it was lost and couldn’t be found and this, that and the next thing, all sorts of excuses. And the other – one of his other sisters, Auntie Gert, called me on one side and said, ‘Raymond, Auntie Dot is hiding that certificate and you’re never going to get it because she’s – your grandmother was illegitimate in the workhouse and she won’t allow anybody to know that.’ So I’ve never found my grandmother, paternal grandmother’s, birth certificate to send to my brother. So she was obviously placed in the workhouse as an illegitimate child and disowned I suppose, so she must have had a very tough upbringing. But she was quite a pretty lady, so, er, why there should be any fuss like that, do not ask me. But anyway, she was a very, very quiet and withdrawn lady but she had five – five good children, two sons and three daughters. So … anyway that’s – that’s my paternal grandmother.

[07:22]

And you said you didn’t see that much of your paternal grandparents?

No, not too much, no, occasional teas and, er, they didn’t get around much and come to us much either. But there was quite the opposite with my maternal grandparents where we did go there a lot because of the past history of Mum and Dad staying there with them and, for months on end, and all that sort of thing. And he – he was the manager, I think I’ve said this, it doesn’t matter if I say it again, he was the manager of a big building company called Bradings, built a lot of the houses in East and West Cowes and various other structures. And he was a really upright standing gentleman, trustee of the Methodist church, in the choir, and he did look a bit like a Spanish nobleman which is quite interesting because there is this rumour on the Isle of Wight that some of us are descended from a Spanish nobleman who drove his ship ashore on the island and stayed here, which is actually a load of absolute rubbish because there wasn’t a Spanish armada ship driven ashore on the island, they all went westward. But anyway, he really was a nice upright sort of slender man. Unfortunately he died 1945, like my father, same age funny enough, of smoking too much but, er, I was supposed – I’m supposed to take after him, which is rather flattering [laughs]. Erm, he was descended from a skipper of the Mountbattens’ yacht and, er, they had a little
lodge in the Mountbattens’ house in York Avenue and – here in the town. And this little cottage, they brought up seven children in it and, er, that cottage is still here.

[10:25]

My maternal grandmother is also descended from a family of Hallidays in the town and they had – the family had a big farm on the outskirts of the town and a boatyard on the outskirts of the town which made small boats, I’m told alternately for the smugglers and then for the Inland Revenue [laughs]. So each one had to be faster than the last one [laughs]. And they operated a rowing service to Newport, five miles up the river, and an oyster fishery. And that was a family of eleven, which intrigues me because only two of the children had children, two of the eleven, which I find rather – rather strange.

*How much of this extended family did you see when you were a child?*

I saw two – two aunts quite regularly, one Auntie Molly who lived in Bournemouth and we used to go and visit her there when we were in our late teens, and an Auntie Milly who lived – still lived in East Cowes, hmmm, and we used to go and see her intermittently. Her husband was a merchant seaman, Auntie Molly ran her own upmarket dress shop in Bournemouth but – and only one other was the wife of one of the males of the family who had emigrated to North America and she was a Lithuanian, who also had emigrated and they married in America, Aunt Laura. And I met her in my travels very much later in life but those are the only ones I ever saw of those eleven. But the lady, my great grandmother, mother of this lot, I saw a lot of. She lived to be 101 and in the latter five years or so of her life she lived with granny and granpy and I remember her vividly, her teaching me how to mend my socks with a wooden circular disc and a spring that you put round the sock and in a groove around this wooden former, and the spring was so strong I couldn’t put it round, she had – she had to do it. But then she taught me how to cross, you know, stitch this sock up but apart from that I don’t remember much about her. I remember how cross she was with Hitler, she was forever saying ‘that awful man’ and ‘we’re going to have to sort him out’ and so on [laughs]. She was a very strong minded lady. My grandmother says that she was – well, she was born on the mainland near Beaulieu,
Exbury, little place called Exbury, and she was rowed across the Solent to be a servant with the – with the Halliday family and married one of the sons. So that’s a – and she was rowed across the Solent to be a servant [both laugh]. Anyway, so it is said, or was said.

I notice that, you know, both your grandfathers are people who were involved with building things.

Yes.

I was wondering was that something, you know, you saw much of them doing –

No.

Growing up or –

No, no the – never saw any of that with paternal grandfather, Sidney. But Gerald, granpy Gerald, the maternal grandfather, was the clerk. He did all the accounting, he was manager and clerk and I used to watch him adding up, and that was astonishing. I mean he would just use his pen and it would constantly move up a column like that [demonstrates], and he – and he would be adding two figures if you see what I mean, two side by side figures, up, amazing, as quick as that. Otherwise no, I didn’t.

You mentioned as well that you had a brother and sister.

Yes, I did.

What were their names?

My brother was Francis Gerald and my sister was Maureen Rosemary. My brother was two years older than me and my sister was three years younger than – younger than me. He died five years ago roughly and she’s still alive and lives in Yorkshire.
How did you get on when you were growing up?

No problem at all. Hmmm, we used to play together, my brother and I used to do a lot of birds’ nesting, which was permitted in those days, but what I can remember vividly about that was if there was a big bird’s nest way up a tree, guess who was the one who had to go climbing up there to see if there was an egg in it [laughs]? ‘Cause the branches were not strong enough for him [laughs].

What’s birds’ nesting?

What’s birds’ nesting? Oh, collecting eggs and we had a huge collection of birds’ eggs. We never took more than one from the nest but it was – well, I’d better not say it was legal, it wasn’t illegal in those days, and later on after Jean and I were married, hmmm, I ditched it all because it had become illegal and I wasn’t quite sure if anyone believed me that we collected them when we were kids. But in retrospect that was stupid, I should have given them to a local museum or something, but anyway, we did get rid of them.

Did you have to do anything with the eggs once you’d got down or –?

Oh, yes, we used do all sorts of experiments. We would – we would blow them and connect – make a little hole at each end of the egg and blow them. But sometimes you couldn’t ‘cause they were what we used to call addled. In other words, they’d – there was a chick and what we used to do then, if we couldn’t blow it, was put it an ants’ nest and make the holes a little bit bigger so the ants could actually get in and eat the – the young bird in there [laughs], oh dear. Erm, but we had – we did have a very good collection of eggs.

Did you collect anything else?

Erm, I collected matchstick covers, I collected stamps, er, and I don’t think I collected anything else. I’ve still got my stamp album and never look at it, and I keep on thinking I’ll sell it but never get around to it. It’s still upstairs, it’s in pretty pristine
condition and a lot of stamps in it but they – they might be rare now but they certainly weren’t then.

_I’ve never been much of a collector, what’s the attraction?_

Well, don’t forget we – all we had was radio and you didn’t listen to that very much, you didn’t have any television or anything like that. And, er, oh, it was just something to do I guess. Erm, my brother didn’t do so much of it, so … he did more homework than I did [laughs]. I was very bad at doing homework, very bad [laughs].

_What did you actually enjoy doing as a child?_

Oh, playing football and playing cricket, that was everything, oh yes. Bicycling, I did a lot of running all over the place. Erm, I ran for Hampshire when I was about seventeen and they then said I – I was so good, to be better I’d have to give up swimming and I said, no, I’m not going to give up swimming, so that was the end of my running career. But I’ve played football and cricket, and hockey, most of my life, and sailing as well, we used to go in boats and things. And then in – well, we haven’t got to apprenticeship yet. Where do you want to go to now?

[21:45]

_I’m just wondering what sort of toys did you have._

Toys?

_IF any, yes_

Er … we had a set of railway engines and a track and what have you, which we played with intermittently but not much, not very much. We were much more outdoors kids, all three of us.

_WHAT does one do in the outdoors apart from play football and steal birds’ eggs?_
Well, run about, go swimming, and walking all over the place. We’d do skipping, er … all sorts of things but nothing of any great consequence. The only thing that had any purpose was – was football and cricket ‘cause you were trying to win [laughs].

Do you want to pull the curtain shut or –?

No, it’s all right.

Right. Did you do much reading? You mentioned the Alexander Dumas novels.

That was about it, I read them a lot. I did read some other books, I can’t remember now exactly which ones they were, but the Dumas ones are ones I remember vividly and I went on reading them for a number of years. But if I was told to read The Merchant of Venice or something [laughs] or learn a poem [laughs] that was beyond the pale, that was not what boys did [laughs].

Not what boys did?

No.

That’s a curious expression [laughs].

That’s true, it’s true.

In what sense, not what boys did?

Well, you know, you were … reading poetry? Boys reading poetry? Good gracious me, beneath our dignity that was [laughs]. I do remember reading – learning one poem but I couldn’t remember it now, recite it now, to save my life.

What was the poem, do you remember the title?

No, I don’t, something about the – a chap carrying a message from Ghent to Aix. It’s a famous poem. No, I don’t remember who –
I don’t know it either so –

Wrote it or anything. Is it a Tennyson poem?

You mentioned you listened to the radio a little while ago. Did you have many other technologies in your house?

Other technologies in our house? No, not really, no. Hmmm, the first thing – bit of technology I had when I became an apprentice was a slide rule, and I suppose in the sixth form we had logarithms, erm, five – five figure logarithms. Er … we had – we had an airgun, which we didn’t like starlings so we used to shoot starlings [laughs]. Hmmm …

Why starlings?

Well, we didn’t like them for some reason or other, I don’t know why really but we didn’t and we used to shoot them. I gave that up by the age of about twelve but, er – so we had an airgun. Erm, what other –? No, we didn’t really. Erm, mother had a gas boiler that boiled our clothes to death in and, no, I don’t think we did, no.

[26:24]

School’s come up a few times in passing when we’ve been talking.

Yes.

I thought it might be good just to talk about it as a topic in its own right for a few minutes.

That’s okay.

You mentioned you didn’t like it much?
Well, I found it boring. I mean French, for example, I did reach the point where I’d got – won the scholarship at the age of eleven and, erm, the funny part was the early French lessons I was top of the class, but I very soon got totally bored with it because trying to learn in the terms or remembering was just too much effort and [laughs] so I – I never really learnt French and the teacher was awful, God bless her soul. She was a nice lady but oh dear, she would pace up and down and read a French story and then start asking us questions which we had to answer in French. And a) we hadn’t listened to what she was saying [laughs] ‘cause she – she would just – we’d be doing something else [laughs], so it was just hopeless anyway. And … I don’t know, it was just the way subjects were taught. Erm, maths was all right, I didn’t mind maths so much and the teacher who taught maths could keep good discipline, the – as could the geography master. And I know that I liked geography but English literature, English language, was taught by – you’ve got to remember that it was the exact war years and so that the male teachers, apart from these two, had all gone off to fight and they brought ladies out of retirement and their teaching methods were so boring. And somehow or other they – they didn’t seem to be able to keep discipline for – I don’t know why. I mean we were always acting the fool and, er, I don’t know –

What sort of teaching methods did they use?

Well, it was her back to the class and writing on the blackboard, you see, well – and you’d copy this down, that sort of teaching. And, erm, I don’t know, we just didn’t do it and our work was never looked at to see if we’d been doing it or not. They gave us homework which we never did, and you were supposed to hand your books in and we would elect the – the boy and girl who were to collect the books and take them to the teacher. We’d elect somebody we could tell we weren’t going to give it to them [laughs]. Oh dear, it was awful, it really was awful.

Were there any subjects you actually liked or …?

No, well, our geography was the one and – and science. The science teacher was – was quite as well and would set us difficult experiments to do and things like that. And in chemistry we could [laughs] – again there was plenty of scope for – and don’t forget, we were – this was war time years.
Mind your mike.

Hmm?

Just mind your mike.

And it was war time don’t forget, so there were all sorts of constraints anyway on when we were – you couldn’t – they couldn’t give us detention because our mothers had to be – would have to be told that we were being kept back at school and, erm, that couldn’t be done. So discipline had just gone out of the window, except the male teachers managed to keep disciplines and so in those subjects we could do all right. Er, one or two of the female teachers could, you know, get it across and keep discipline.

Was it a real noticeable difference between the two then?

What do you mean, the two types of teacher?

Yeah.

Oh, yes, the men could keep discipline somehow or other without an effort, you know, they – you be quiet boy, and the boy would be quiet, but the ladies didn’t seem to be able to get the right tone [laughs] to make you do what they wanted [laughs]. And, oh, it really was bad. And anyway …

[31:40]

What sort of school did you actually go to? Actually it might be a good idea to put them in order. So you first went to which school?

Er, my first school was an army school which I went to for, erm, a couple of years I suppose. Then I came to East Cowes and went to a local primary school for another couple of years I suppose. Then we moved to Parkhurst, and I went to Parkhurst
Primary School, what was I? About three I suppose. ‘36 to ‘39, yeah three, and, erm, won a scholarship, went to the Newport County Secondary Grammar School from the exact war years, ‘39 to ‘45, and there was only one other secondary grammar school on the island and that was at Sandown. There was another grammar school in Newport, private - private school. Erm, and then you did two years in the sixth form, the last two years were in the sixth form, and there were only two of us in the science sixth form.

You and who other?

A chap called Barry Smith who lives up on the Wirral now, and is not very well. Hmmm, he’s sort of given up it seems to me but that was it, there was – and so it was easy for the – and the sixth form science teachers were all men and they kept discipline quite well, so – and the subjects were interesting and well put across, so that was – I enjoyed that, I enjoyed school, those two years of school.

How did you decide to specialise on the sciences?

Erm, well, in the – I did very well indeed in the, er – it was General School Certificate you did at the end of the ordinary years and Higher School Certificate at the end of the sixth form. And at general school, my general school results in science and maths, and geography, were extremely good and so you just did those subjects.

What did you like about them?

What did I like about them? Well, geography I just – I just liked geography, learning all about the world and the places that were in it and why they were in it and all that sort of thing. And one thing that we talked about as a for instance, which is now generally accepted, was continental drift. Now at that time that was just a theory and a lot of people thought it was rubbish. Now science has determined that it did happen and that these continents did fit together. Erm, all that sort of thing I found very interesting in geography and, erm, you know, reptiles and all that sort of thing all came into geography. Erm, and science was just, we were playing with things weren’t we? I mean we used to take great delight in getting a piece of a shell of a two-two
round, fill it up with explosive of our own making, put it in a Bunsen – on the top of a Bunsen burner, and covered with sand until it exploded, and it would then send the sand all over the ceiling which would steadily drop during the course of the [laughs] – oh, we got – we got away with things like that, oh dear, erm –

Was this on the syllabus or –?

No, of course it wasn’t [laughs] nor – well, explosives were to an extent but, oh dear, that was just things we managed to get away with in the – in the sixth form. But, no, and we were playing football, we were – in the sixth form we were beginning to be allowed to play football against, and cricket against, Portsmouth high schools, and Southampton, whereas prior to that we were confined to the island.

Hmm. I wonder actually, sort of growing up on an island, how much do you get to see of the outside world. You mentioned about the war.

Nothing, nothing during the war, no. And prior to the war we couldn’t afford to leave the island, well, not to go far anyway.

How well off were your family?

Not very well off at all, no, no, we weren’t. We were well fed and we could afford bicycles and that sort of thing, that’s as far as it went. Motorcars, you were rich if you had a motorcar, gracious me, oh yes.

Did your parents have any particular hopes for you, what you might do?

No. No, not that they ever said. Erm, no, I don’t sort of recall them ever even hinting at – and, er, jobs didn’t really come up until quite close to the, you know, almost the last term, er, you thought about what you were going to do and neither Mum nor Dad – and you see, if you worked for a firm like Saunders-Roe you were thought to have a job for life in those days. And of course people had had just that, it was only later that it got bad in engineering but the aircraft firms were all – you know, that was a wonderful career offered in the aircraft industry.
Was that something you’d seriously considered from –?

No, I – at the end of the war the government were offering what they called cadetships in the forces, erm, particularly in the air force and the navy and the fleet air arm. And I applied for one of these, you were – and you were offered a degree of training at Cambridge, you could train to be a pilot and you were an officer from the beginning and you had to have a Higher School Certificate with good levels, which I had. And I had my medical and – and interviews and passed them all and, erm, heard absolutely nothing. And Dad was not very well, he’d – he’d had pneumonia badly, which left him with a dicky heart, and so he was on half pay. So I had to do something and so I joined Saunders-Roe as an apprentice in September, and still I heard nothing. It never occurred to me that I’d dug a hole for myself and after about a month or so I wrote off to them and said what was going on, I hadn’t heard anything and, er, was still very interested, and I thought I was just going to be told when to come. And they wrote back and said, I’m terribly sorry, we’ve had the last intake and you were not on it because you were in a reserved occupation. Nobody had told me that becoming an apprentice at Saunders-Roe meant I was in a reserved occupation, I didn’t even know what it meant, never heard of such a thing, but it excluded me from – so I stayed at Saunders-Roe, had to.

How did you feel at the time?

Erm, I was quite enjoying being an apprentice at that time and I was – it was a really good firm. Well, it’s – when I say was, it still is, but different names all over the years but still the same place. And, er, so there I stayed.

[42:45]

I think we should probably move on to talking about the apprenticeship tomorrow but I’ve just got a couple of, I think, final questions for today really.

Right. Yeah, go ahead.
First when we were talking about enjoying science at school and I was wondering which bits of it appealed to you most, was it –?

What bits of the science?

Hmm.

Golly, what a question, that’s a long time ago. Erm, bits of the science that appealed to me? No, I think really it all did. He was a good teacher, erm, and he would – if I can put it, the only word I can think of at that moment, would cheat. For example, he’d – erm, you’d do an experiment with a pendulum and he would – and he’d say, now use that pendulum to determine what the force due to gravity is. And he would use a steel knob for the – for the pendulum itself and then he’d put under the – under the bench he’d put a big, erm, electromagnet, so when you tried to prove that it was 32.2 it wasn’t, it was something else [laughs] and you had to – you had the job of explaining why it wasn’t 32.2 [laughs] and that sort of thing. It was very, very good and it kept us going. And, erm, all sorts of things we would do; projectiles, for instance, was quite an amusing thing in view of later things with me and we – he was having an affair with the art mistress and would leave us alone on Friday afternoons and we would use any apparatus we could to fire things out of the window, usually bits of chalk, and we’d fire them across the road into people’s gardens [laughs] and then try and measure the velocity, calculate the velocity, that the bit of chalk had achieved going out of the nozzle, erm –

Were these mechanical devices or chemical or –?

Oh, yes. Oh, no, mechanical, oh yes, springs and, er …

Did you prefer the theoretical side of science or the practical stuff?

Oh, I suppose it was the practical stuff of firing bits of chalk was the bit of fun but, no, then to try and calculate it, why it went as far as it did, was quite an interesting add-on to the fun.
Were there any particular sciences or technologies that you were interested in?

I can’t think of any.

In the wider world –.

In the wider world at the time? Oh, air – I was aeroplane crackers, oh yes. Any aeroplane, erm, I was in the Air Training Corps as well at the time. I was their gym instructor amongst other things and, erm, we went on camps and things and flew in the – this is all while I was at school. Er, went to Midhurst and flew in the Walrus air sea rescue aircraft, for instance, and those sorts of things, you know, that was – that was the high life, that was.

What did you like about planes?

Well, you were just up – you’d left the earth hadn’t you? You were up there flying about and it was the earth down there. And the acceleration of the take-off and all that sort of thing.

Did you read about them as well, the model planes?

Oh, yes, I had magazines and by that time I was reading magazines like The Aeroplane which is still – still exists. I think it’s The Aeroplane now, and Flight, and bought – was able to buy books. Because the last certain – the penultimate year in the sixth form anyway, I was able to be a fire watcher in Newport. This came out of the Air Training Corps thing and we would – I was – on Saturday evenings we would – there would be about four or five of us in a big room in one of the, erm, big grocers’ in Newport and we would fire watch. So if there was an air raid somebody had to go and report to, erm, a central point that you – who you were and how many of you were there, and were you ready and all that sort of thing, did you have your buckets filled with water and that sort of thing. Erm, and you had that one night for which I was paid five shillings, which was a fortune, absolute fortune, so I was able to buy
these magazines and – and things. Hmmm, golly, I used to get tired. We used to see how many pubs we could count in Newport. We didn’t go in them but wander around the streets counting the pubs in Newport. There were a heck of a lot, a lot of them have disappeared off the face of the earth.

*I think my final question for today was actually about religion. Did you go to church as a child?*

Not until we moved from Parkhurst into East Cowes, which was right at the end of my school years, and then I joined the boys’ brigade and various other things, and that’s another story about then. If I hadn’t done that I wouldn’t have met Jean, which is another story [laughs].

*I suppose a good place to stop for today, I think.*

Pardon?

Jean Wheeler: Not to be glossed over.

Not to be glossed over, no, not at all.

[End of Track 2]
I was wondering if you could tell me a bit more about the start of your apprenticeship at Saunders-Roe. How old were you?

How old was I? Er, it was September 21st, 1945, so I was just coming up to eighteen. And we – we had in the Saunders-Roe a proper training school at the time, which was along at the – where the Royal Naval College had its hospital, at Osborne. And we had workshops, erm, and a drawing school there, and the technical apprentices and the works apprentices were all mixed up together and did three months – three months? Yes, that’s roughly right, of workshop training, which was bench work, filing and if you didn’t hold your file horizontal you were rather crudely tapped on the shoulder [laughs], and lathes and vertical drills and all – all those sort of basic equipments we worked on.

What’s the importance of holding a file horizontally?

Well, the surface will be flat. If you – if you rock it you’ll have a rocked surface on the – what you’re filing, so you had to keep it and you were told about your elbows [laughs]. Oh, yes, so you really – it was really quite disciplined. And then on Saturday morning if you were a technical apprentice you did – er, you had a drawing course which, erm, continued after you’d finished the three months’ workshop experience.

And what sort of apprentice were you, a technical or works?

Technical.

What’s the difference?

Well, where you’re going to end up, whether you’re going to end up in the design department or the works, and whether you’re going to go to – well, you are going to go to, erm, evening classes, but which ones? And the works had, er, very few evening classes but the design, technical apprentices, had quite comprehensive evening
classes. But I was, erm, assigned to be a part time student at Southampton University, which was University College Southampton at that time. And I went two days a week, so I was expected to make up the time that, erm, I was away for two days. I was expected to work hard enough in the three days that were left to do exactly the same things as the rest of the class, so it was quite tough to say the least. And the other thing about it was that I actually went in with the full time students at the – at Southampton. And they did, for instance, maths five days a week, so I could only do the two days, so it was just hopeless. So I did my maths as a correspondence course with a company in Oxford, which was very, very good indeed, and that worked a treat. I learnt more maths that way than I ever learnt at that – at the university, but it was tough, it was hard, to do all that and then be expected to make up, not the time but the work, and it really was hard.

[05:19]

*Can you give me a flavour of what a day was like as an apprentice of one of your works days rather than university day?*

On a works day? Well, you’d be given a job. The one I remember vividly was the last job we were given which was to make from a lump of steel that you had to cut up, a one inch cube. And there were three to a bench, you had to be able to put your finished cube on top of one another and it had to not to exceed one thousandth of an inch in error with the three on top of one another. So that – that was a measure of what was expected of you.

*How does one make a cube that precisely?*

Well, you just have to horizontally file it [laughs] and put it on a steel, a very accurately finished, steel plate and then measure the – the height of it and keep on measuring the height of it till you’ve got it just right. And we didn’t have any trouble with that, we’d been very well taught so it wasn’t any effort to – well, I say it wasn’t any effort, it wasn’t difficult to do it.

*So is that something that occupies an entire day or just a part of it?*
Oh, yes, no that took several days actually, cutting the – doing the first cut out and then making sure it was – all the angles were right angles and … that was quite a tough exercise actually.

Where did you fit in the correspondence course?

Where did I fit it in?

Hmm.

I was living at home so that was evening – evening work, and we – we worked Saturday morning as well. Saturday morning was the, erm, drawing office course, which was for the technical students only. The works students spent Saturday morning in the – in the school.

I guess there must be more to learning to draw than just being given a pencil and a ruler. What was actually involved?

Oh, you actually did drawings, you were – you were taught how to sharpen your pencil and, er, you had to practise, hmmm, lettering and things like that, erm, and actually produce a drawing of something. Erm, I’ll show you, if you like, the – some of the drawings I did at college, and I can’t believe how good they are right from the beginning. But the other thing that they couldn’t fit in, in the Southampton course, was theory of machines.

[break in recording?]

Pick up straight where we left off.

Yeah. And so I did theory of machines at the higher national course at the local Isle of Wight college, which was – at that time was an evening institute. So that was all in addition to the Southampton University two days a week, and believe you me it was very, very hard. Work was never difficult after those years at apprenticeship.
And how many hours a day were you working just as a rough –?

Well, the – the – I think it was a forty-eight hour week we did at the firm. Yeah, I’m sure that’s right. I didn’t find that hard, not that aspect of it. And then in the evenings, well, in the evenings was working. I don’t know how many hours I did. When I show you the drawings we did you’ll see how – and we – my mother and father by this time had moved into East Cowes and bought themselves a sweet shop and our bedroom was the attic bedroom with no heating except a small paraffin heater. And I used to do all my studying with a blanket round my legs [laughs] in this bloody cold attic. Oh, dear, those were the days. And I don’t remember complaining about it, that was the way things were.

[10:50]

I must tell you a funny incident. When we, er, had our first day at the university we were all assembled in a big lecture theatre, and of course this was the end of the war and so there were a lot of ex-servicemen, er, were coming in to do university courses and so the lecture theatre was full. And there was a lady who was the professor of mathematics, ex-Farnborough, and er, she was an expert in wing flutter of aeroplanes. And she came marching in and I – oh, I need to go back because you wouldn’t be familiar with the fact that in those days you got an intermediate degree and you could get exemption from it with a Higher School Certificate. Anyway, she came marching in and said, ‘Would all those for intercourse please follow me,’ and the whole body of men stood up and followed her out the door [laughs] all giggling our heads off. Sorry, that is a very clear memory, I can actually see it happening and see this lady coming in.

[12:40]

Anyway, I must tell you that I found this so hard at one period in midwinter that I told my father I was quitting and I was going to go and – go to Birkbeck College in London and do photography. He just looked at me and said, ‘No son of mine is a quitter. If you want to go and do that you know where the front door is. Go out of it
and please don’t come back.’ So that was impossible, I couldn’t – I couldn’t do that, so that was it and I had to continue. That’s what a firm father I had, and very grateful to him I am, anyway –

*What did your parents think about the career choice, career path you were going down?*

Oh, they were very happy about it. If you – if you had a job at Saunders-Roe that was a job for life in those days. Or was thought to be, didn’t turn out like that of course, which is a story we’ll get to later, but er, if you got on what was called the monthly staff that was it, you were fixed for life it was thought. Which of course it had been.

[14:20]

*I’m interested still in this technical drawing. I’ve never done any so I’ve no idea how one does technical drawing.*

Do you want me to go and get you it now and show you?

*If wonder if you could just explain what’s actually involved ‘cause I’m guessing it’s not freehand or anything like that, I assume there’s some discipline to it or something –*

You have a – in those days a drawing board was a big board with a special edge down the left hand side. And then you had what was called a T square that you pushed against that edge and then you could – and then, erm, a transparent right angular, some with forty-five degrees and some with thirty, sixty, that you put onto the T square and slid along to do verticals or anything else. You – we were all taught to have a chisel edge to our pencils, hmmm, and you had a little pad of glass paper to sharpen it on, so you kept it sharp. And that was your equipment, and a rubber of course [laughs]. And, er, you just drew on it [laughs].

*What makes a good technical drawing?*
Well, erm, there was an incident when I returned from postgraduate college and had to, erm, get a – a drawing to the works of a test specimen and there was no draftsman to – available to draw it, so I did a three dimensional sketch and arrowed all the joints and a detailed – detailed sketch of that. And I remember vividly the chief draftsman saying to me, ‘Ray, the works won’t accept that. They can’t work to a drawing like that.’ And I said, ‘Why not?’ And he said, ‘Well, we’ll have to send it through and see what happens,’ and to my great amusement and pleasure the works said could they have more drawing like that please [laughs] because they were – the drawing you produced, the standard drawing you produced, had three views of the object, erm, and then a corner of the drawing that said what each component was and what it was to be made of and so on, so you actually had three views of the object you were trying to convey to be made. Does that explain it?

*Sorry, what sorts of things would you draw?*

What were we drawing? Oh, components of an aeroplane or even at college we actually drew an aeroplane but, erm, what can I say? Well, for instance, a bracket that would hold something up, er … or a rib of an aeroplane wing, that sort of thing. Or it might be a mechanical component of the control system or something like that. Does that explain it?

[18:55]

*Hmn. How strictly were you monitored as an apprentice? Were you left to get on with things or was that –?*

Oh, no, there was constant monitoring, oh yeah. Oh, no, I was well supervised. Erm, I got told off because I was playing interdepartmental football at lunch time and – but in a very muddy day I’d be a bit late because I had to go and wash it all off, and I got told off for that well and truly. ‘If you’re not back in time, Wheeler, you’ll have to give up your lunch time soccer.’ And also I was captaining the company apprentices’ team and we won the Isle of Wight league we were in, and I was quoted as the young footballer of the year [laughs].
What were the other apprentices like? How many of you were there on this course as a start maybe?

I would think it was about thirty, I would say, a bit under if anything. And some of them were living up there at the establishment. I didn’t of course ‘cause I lived in the town but quite a – quite a fair proportion were actually living at the hostel that was attached to the training school.

How did you all get on together?

Very well indeed, always have. Engineers, I’ve found, always get on, I don’t know. I mean that’s a terrible generality but I’ve found worldwide engineers get on.

Were you a particularly close group or …?

No, not particularly close I wouldn’t say, no. Well, you were fairly close to one or two but they were only there three months and that went by like a flash.

How were the permanent staff towards the apprentices?

Oh … it was a bit military. Erm, they weren’t close but also they – they weren’t distant either. Er, and the discipline was quite – fairly strict. The, er – the boss was a chap called VT Stephenson who was quite noted as a disciplinarian and running a tight ship, and he did. The, erm – when I was – much later in life, like 1995 I think it was, I was made a royal designer for industry, he was then in South Africa, so – no, New Zealand, and he – he wrote to me. A very old man he was then and not longer after, he died, and he wrote me a very nice letter congratulating me, he’d heard it from somewhere. Oh, at County Press, people were – he was being sent by his family at County Press.

[22:39]

Were any of the other staff and teachers who you remember in particular?
Oh, yes, I wish I could remember their names but, yes, I do, I … the, er, chap who taught us drawing, I can remember him quite vividly but again I can’t quite remember his name. I’ve got his nickname on the verge of my tongue but it won’t come out. Erm, he was very good but – and I think when I show you my drawings you’ll – you’ll see that I had been well taught.

*So you were an apprentice at the start with the, I’ve forgotten what it’s called now, the sort of three month period at the beginning –*

Yes.

*When you were doing –*

The training – the training school.

*The training school, thank you. What happened there?*

Sorry, what are you asking me?

*What happened after the training school?*

Oh, afterwards. VT Stephenson controlled where you went and, er, my first assignment was to the tool room, er, where tools were made to manufacture components for the aeroplanes. And, erm, that was rather strange because almost as I went into that tool room my grandfather went out [laughs]. But, erm, I – one of my very strong memories of that was, er, the first job I was given in the tool room was to be taught, by the chap who kept the floors and benches clean, how to – how much disinfectant to put in the watering can, er, how – how much you should put down on the floor or the bench, er, to – to dampen the dust down but not – not flood the floor. This guy was dedicated to cleaning the shop and that was a great lesson for me, that this chap who, you know, could be regarded as beneath you, er, was such a dedicated chap, and that’s remained with me right throughout my life. I remember it quite vividly, going into the loo and filling the can and putting the disinfectant in, and then
gently waving the can onto – over the floor and him standing by me [inaud]. That really did impress me no end, that a chap at that sort of level of work could be so dedicated.

*Was that something you encountered elsewhere in Saunders-Roe?*

Yes. Most of the workforce were dedicated people, yes. It was a very well-knit company, and it’s survived to this day.

*Why do you think people were so dedicated?*

I think anything like that comes down from the top, and I think that was Sam Saunders made that a part of the company when he came to Cowes in 1901 and, er, set up his company. And I think he gets a dedicated workforce and then that feeds itself on, on, on and on, and then the people he selects to run it for him and so on, all that feeds down to the workforce. And he himself sets an example of it, that’s vital. He was a real gentleman, Sam Saunders.

*Was he still active when you started there?*

Oh, no, he was dead, he died in 1933.

[27:30]

*Can you think of any dedicated people you encountered in particular when you were going through your apprenticeship?*

Well, the foreman of the tool shop was about four inches taller than me, and I was nearly six foot, I’m a bit under that now ‘cause I’ve shrunk [laughs]. But he would stand over me and he’d look down at my – what I was doing and you could almost feel the, erm [adopts authoritative voice], are you doing this right boy, sort of thing. Er, and all of the workmen were – were very, er, dedicated. You – you hear of acting the fool and things like that but there was none of that, they all worked hard. They
talked, while they were working they talked to one another, but that wouldn’t in any way stop them doing their job.

Did you take tea breaks and things together as well?

Erm, you didn’t have a tea break, not in those days, no, you – in a sense you did I suppose but, er, tea was brought round on a trolley when you said what you wanted and were given it. Er, and you drank it on the job, you didn’t stop or anything like that, gracious me, erm …

What does a tool room actually look like?

Well, erm, you had a whole series of benches, erm, in rows and the – a bench – there were three, very much like the training school, three to each side of a big wide bench with a, er, a clamp. You each had a clamp and your – a place for your toolbox and – and so on. And I was encouraged to make quite a few of my own tools, which I still – I still have, erm –

Such as?

Well, a screwdriver, for instance, you’d make and you’d harden – harden the tip and, er … oh, I can’t think of anything else. Oh, er, things like something to scribe an arc of a circle with tubes that – er, that you’d screw together and make them all fit so you could do a big radius if you wanted to. Er, and then the fittings that have the scriber, the point that would scratch a line or a pencil or whatever, all sorts of bits and pieces like that, you know.

What sort of other things did you make there?

What, the – what, the tools you mean?

Yeah.
Well, the first tool was a rectangular, erm, piece of steel, something like quarter of an inch thick that had about six inches by two inches, I suppose, with a hole at each corner and a radius at each corner, er, that would go down into the works and the – the chap on the shop floor would, erm, clamp several pieces of nearly cut to size sheets of aluminium to it. And then with a horizontal file we’d, erm, file that down to the size and drill through the holes so he didn’t have to measure anything, he could just straight away make the component from that tool. Er, I – and that caused rebellion on my part which, er, didn’t go down very well. Because I was given what was called a tool drawing of this component, you see, and I made it – I looked for the, erm, the little corner of the drawing that said what the limits were to be and there was nothing in it, nothing in that at all. And so I made it exactly to the size of that tool drawing and to my astonishment it was rejected by inspection, and I went back and said well, what’s wrong with it, it’s exactly right. Oh, that’s the point boy, er, everybody knows that you make tools one tenth now oversize to allow for a bit of wear and tear. And I said, well, that should be on the drawing, make it ten over size or give that actual dimension on the drawing. [Adopts authoritative voice], ‘Do as you’re told boy, just go and make it ten over size,’ [both laugh]. And that was my first component I made in the factory [laughs].

Was it common for people do you think just to get the first one wrong and get told off about it?

I was the only apprentice in the – in the tool room. There were several of us who were – you were split up all over the place.

[33:56]

Did you ever make other things just, you know, for fun or –?

No, no I didn’t, no. Er, you accepted you were there to work, and work you did. It wasn’t – I’m not saying it was iron discipline unlike perhaps a prison working in there, it wasn’t like that at all. I mean it was all very amicable.

Was anyone of particular help to you in the tool room or –?
No, not specially, the chap alongside me – er, funnily enough this chap lived in the house that my great grandparents had built in East Cowes [laughs]. That’s funny, I – I have found that life is full of incredible coincidences. One I can remember quite vividly, if I can digress, was during the course of, erm, designing hovercraft we had a license agreement with the Bell company in America and I had to go over there a lot, and the US government were very interested and all sorts of contracts were – were being run, so I’d meet a lot of people in the US navy and various other people. And, er, one day I had to go to, erm, Boeing because they wanted us to take out a license to build their hydrofoil designs. And, er, I’d been trying to get hold of a navy – a US navy senior man, about some contract that we were working on but I’d been unable to get hold of him. And, er, I had to go from Seattle up to Vancouver to read a paper to the – at an international conference there and Boeing were going to take me in their experimental hydrofoil up the inland waterways from Seattle to Vancouver, but the weather stopped it and, er, I had to fly up. So at the last minute I booked myself a flight, I got onto the aeroplane and sat down, and a few minutes later this guy actually came and sat down beside me. Now how about that? I’d gone from here to the other side of America, he’d come from Washington, and we met on this flight and he was going to Vancouver.

The US navy guy?

Yeah. Now that has remained with me as one of the best ones but I do wish I’d written down a lot. And my advice to you would be, if ever you get these coincidences write them down, give yourself a little book and – a coincidence book, ‘cause it really is incredible some of the coincidences you get in life, and there’s a lot.

Yes, it’s a smaller world isn’t it than you think?

Hmm, yes. So …

[37:52]

Do you think it is just that or do you think there’s something more to it?
No, no I don’t, it’s just – no, I’m not one of those no, no. Although I did – I did get very religious in the – at this – whilst I was an apprentice. I, erm, helped run the Lifebuoys division of the Boys’ Brigade, I was an officer. Arm, and the other two officers, one worked – was an apprentice at JS White’s, John Samuel White’s, and the other one was, er, an apprentice at a firm called Groves & Gutteridge. And he, Tony Dorey, was an evacuee from Guernsey during the war and, er, he and I designed and built our own seventeen foot sailing boat. And we’re still friends, it’s – and strangely enough he became technical director at – chief designer and technical director at, erm, Vosper-Thornycroft in Southampton, and I became chief designer and technical director here in East Cowes, so we’ve stayed in contact all the time – all through these – in fact it’s time I gave him another phone call.

You mentioned that you became very religious while as an apprentice.

Oh, that’s right. Well, the Boys’ Brigade is a religious organisation and, er, in those days we would – once a month we’d parade round the town with the Boy’s Brigade band and I was the standard bearer, and we’d have a little service in the schoolrooms of the church. And, er, then we’d go to morning service and then evening service, and towards the end of my apprenticeship the – the local, erm, what do they call themselves now? Not vicar, a preacher I suppose, persuaded us to, Tony Dorey was the Guernsey chap and I, to form a preaching team at that tender age [laughs]. When I look back on it I think these under twenty-ones boys going round preaching around the island, it’s – it just defeats me that we could be so arro – so bloody arrogant really, to go preaching to people at that age [laughs] oh dear. Anyway, we did and we alternately took the service and, er, then the other one sat down and prepared himself to give the sermon. And, er, I don’t know how many, we probably did about half a dozen I suppose, including our East Cowes church. We took that on one occasion, and there was me preaching to my grandmother in the church, oh dear [laughs]. Talk about teaching your grandmother to suck eggs, oh dear [both laugh]. But anyway, erm – and the sequel to that was that when I went – er, when I won the Spitfire Mitchell Memorial scholarship I went full time to the university, having just one year to go for my degree. I searched around and went to various churches in Southampton, er, sort of Methodist and Presbyterian and so on, and I was horrified because this East
Cowes church was such a friendly place. You know, if any new person went in they were greeted and talked to and, er, very nice to see you and all that sort of thing. Nobody spoke to me and, erm, I must have gone to at least four churches and one of my fellow students said why don’t you try the Methodist church at so and so. Well, that’s where I met Jean, and soon found out that she was born in East Cowes and we – we got on like a house on fire from the beginning, so – and still do. So it’s still a very happy marriage indeed, we’ve just had our diamond wedding anniversary.

Do you remember when you first met?

Pardon?

Do you remember when you first met for the first time?

What, Jean and I?

Hmm.

Yeah, in the church, and I was welcomed, so I did stay. But I still can’t believe those churches, er, not saying anything to you, not even good morning and pleased to meet you, or something. Nothing. I mean I’m not the least bit surprised that they – so many of them have ceased to exist.

[44:30]

Any particular denomination or –?

Well, I – my maternal grandparents, er, were very staunch Methodists and so I followed them in that but – and I became a trustee of that church and the treasurer and, er – but then – I’m digressing from the sort of historical bit now, erm, but it’s a reflection of me. Erm, the trustees met one day and a chap who was an ex-prisoner, and that apparently was a disgrace, which to me it wasn’t, and he wanted to form a football team for young people and could he please use the schoolrooms to change in. And, er, I listened to the trustees [adopts authoritative voice], ‘Well, we can’t have
this ex-prisoner in our church,’ and phrases like that were kind of being said. And I listened to all this with absolute horror and, er, I said – I interrupted and I said, ‘Excuse me, I thought this was God’s house, not our house,’ and deathly silence. And of course, you know, here’s me, what was I at the time? I suppose about twenty-five, telling them off so to speak, and these were, you know, sixty year olds and so – and then I said, ‘Why can’t we let …?’ And then they started, they’ll make it dirty and all this, and I said, ‘Why are you anticipating they’re going to make it dirty? Why can’t you let them come in with strict instructions as to how they’re to behave and if they don’t behave like that, then kick them out? But surely we must let them have a go.’ ‘No, no, no, it’s our house and –,’ and I said, ‘Look’ I said, ‘if you want a new treasurer, you pass this resolution, because I’m not – I’m not having anything to do with a church that will behave like this, it’s not right,’ and I did. And one other trustee with me, we quit, and er, that was really the end of me and Methodists, so I done – and that was wrong, I should have stuck it out and had my say. I was wrong about that but when you’re twenty-five that’s the sort of – the thing that you do without enough thought. So, but I don’t regret it really ‘cause I – I had to stand up and be counted, that wasn’t right; he should have been allowed to – he shouldn’t have been condemned because he’d been a prisoner, all absolutely wrong. That’s my father talking.

[47:50]

_I was going to ask actually, it’s – was there anything particular –? I’m trying to phrase this question, what part does religion play in your life? What do you look for in church?_

Well, I don’t go to church any more. Er, having spent four years in London, er, as a postgraduate with no church nearby to go to anyway, I just lost contact with the – I know a lot of people from the East Cowes Methodist church, erm, or I did, unfortunately a lot of the ones that I knew are no longer with us. But, erm, I don’t go to church any more, I’ve just lost it. Not for – I’m not saying – I love hymn singing, I still do, and if I go to a funeral I really sing my heart out, I can’t help it, that’s a Methodist tradition that you – I mean the hymn singing at the church when I was a youngster was amazing, absolutely amazing. And I miss that, I must admit, but
there’s so many other things to do in life, I just lost it. I do regret that, I should have stayed with it.

I hope you don’t mind me asking this but what do you believe in now?

What do I believe in?

Hmm.

Yeah, you can ask me that. Erm, I’ve never been asked that. I suppose – well, I believe there was a chap called Jesus Christ who lived on the earth and who was an exceptionally good person and stood up for things and so on, like I’ve tried to do and, erm, he’s an exceptional man. And I – I believe there is a God, what God I don’t know, but I can’t believe that this universe hasn’t got some unique being behind it all. Er, I hear all these theories but somehow it started and I understand what the scientists are saying, but I still believe that behind it all there is a God. Erm, I don’t believe in life after death, except what you’ve left behind and the influence you’ve had on others. Er, I believe that’s important and that you always should remember that, that you have influenced people in your lifetime, er, and that does go on. So that’s about it really. Erm, I just do not understand when very intelligent people, erm, archbishops and those sort of people, the way they talk about God, I just don’t understand it anymore, but to me it doesn’t make sense. Maybe that’s an engineering scientist talking, I don’t – I suppose it is but that’s the way I feel.

And when does that –?

I mean I think I’ve had, I hope, had a good influence on my children which they will pass on, and that’s come from my father and it’s come from his father. And that’s how I will live forever, so to speak, not any other way. Does that make any sense? That’s right off the top of my head.

That’s the best way really, so – but when does that develop? I know you mentioned that you went four years without going to church in London, I was wondering if there
was any point in your life that, you know, it went that way as opposed to previous practise?

No, I don’t think so, no, it’s just time and other interests have sort of taken over really. But I do think about, erm, God and Jesus and so on still, that’s in me, that’s a part of me, and that’s how I look at it. And, as I say, I love hymn singing and during – I don’t think I’ve mentioned this, that was one of the things we used to do as a family. Mum was a good pianist and, as I have mentioned that she used to sing in public, and we used to gather round the piano and sing all sorts of songs, *Over the Sea to Skye* and things like that, as a family. So – and I was – to my intense astonishment, when I was at primary school, I was sent to – they have competitions on the island, they still do, and I represented the school and sang, I think it was *Over the Sea to Skye*, er, as it happens, for the school, but I whether it won anything or not, I’ve no idea. But I was completely astonished to be chosen. How they were chosen – chose me, I don’t know. I suppose singing that somebody could hear me, I suppose, ’cause I always sang with a great gusto [laughs].

*Have you ever played a musical instrument?*

I was taught the piano for a while and I got so fed up this continual business of scales and that sort of thing, and I got so fed up with it that I quit, and that is one of my few regrets in life, that I didn’t persist with that, and I wish my mum and dad had made me – made me continue. But, er, I think they were very sympathetic, Dad was anyway, that I hated these bloody scales [laughs].

*One of these things you’re allowed to quit then.*

I was allowed to quit that, yes.

[55:05]

*Getting back to the subject of the apprenticeship, I was wondering how long were you in the tool room?*
Oh, about three months I guess. And I went from there to the press shop, and that – I have a vivid memory of that. At that time, and this is interesting about engineering as it was, if – you were supposed to get into work at eight o’clock and if – you were allowed one minute’s grace and if you went over that you were sent to the works manager to explain why you were late. And it was in his prerogative to decide whether you were sent home or not, for the rest of the morning. And the – the foreman of the press shop was a little wizened little man, a complete contrast to the tool room [laughs], erm, foreman and he used to stand by the clock and watch me coming in and we – we lived, er, in the, I suppose – you know, we drove along past the Union Jack building. That length is what, half a mile I guess, that road? We lived at one end of it and the press shop was the other end of it, and I would sprint, I’d be on that doormat putting my shoes on when the siren went to summon you to work, and I’d sprint and I would just get 8.01 and he was – he noticed this and so he said, ‘I’ll get you, you young bastard. I’ll catch you at 8.02 before you leave here,’ and he never did [laughs] and he was there every morning waiting for me to be late [laughs]. But that was boring, the press shop, and it was just running grinding machines over tools to sharpen them up. Erm, things like cutting circular holes, it was just a press that you wound – wound it up and then bang and let fly, and a plunger would come down and punch the hole out and that would do it via a tool of that diameter. And so you would face it off so that there were sharp edges to it, and that’s all I was doing day after day. How anybody can go on doing that all their life, I don’t know.

[58:00]

But, erm – then they moved me to, erm, the estimating department, which most of the work in those days on the shop floor was – you were given a time and if, er, you could – you were paid a rate that was fixed to that time, and if you beat it you would get a bonus according to how much you beat it by. So one of the departments was a rate fixing department, so you had estimating and rate fixing all together. And, er, what was so interesting, and I did enjoy that department, the blokes were good and very friendly. And, er, I was first – the first job I was given, erm, a carpenter up at the experimental department was making a table, a wooden table, to be used in the test shop, and I was given this drawing and told to estimate how long it would take to make. So I did this estimate and they said, no, go up and negotiate with the – with the
workmen, so I went up and quite … concerned about [laughs] – about this. I mean here was this experienced workman, and he was about fifty-five I guess, and me, this – I suppose I eighteen at the time and totally inexperienced and going – I thought this was a bit stupid but anyway I found that man, presented him with what I thought and he said, ‘Have you allowed time for me to sharpen my tools?’ I took a gulp and said, ‘No, I haven’t.’ And, er, so I said how long does that take, and he told me, and it sounded all right. And I said, ‘Well, what do you think of the time?’ ‘Oh, that’s all right’ he said, ‘that’s okay, I’m quite happy about the time.’ And he said, ‘But next time boy you remember, there are other things than just making it that we have to do,’ so that was another lesson learnt [laughs].

*How do you actually –?*

But then – then they gave me a whole series of exercises to do where the components had actually been made, and so I was – I wasn’t told what that time was, I was to estimate and then check with what the actual achieved time was. And that was very instructive indeed, that was, and I was in there for six months I think, er, nearly anyway if it wasn’t six months. And I learnt an enormous amount then because it was – they would give me all sorts of different things, from machining components to handmade components and, er, different parts of the factory, very – learnt a great deal then, I did.

[1:01:50]

Er, and then [laughs] and very interesting the next phase. I was sent to the tool drawing office and, er, the foreman was new, he’d just been employed, and he said, ‘What I want you to do Wheeler, is draw up the wing jig for the new Princess flying boat’ and I took a gulp, ‘Yes, okay.’ Er, I wasn’t even quite sure what a wing jig was.

*I was going to ask actually, what’s a wing jig?*

Erm, well, when you build the wing you’ve got to have it supported in some manner haven’t you to put it all together, and that – that something is what is called the jig. So it would be a structure at each end of the wing, for example, that would hold the
wing in place and you’d run a spar from one bit of the jig to the other end of the jig and have a structure there to hold it, hold each end. And then as you built it up you’d have to have other bits holding it together, if you see what I mean. Well, I didn’t even understand that, I hadn’t – that was – I had a vague idea that’s what it meant, just as much idea as you’ve had. And, er, so I set to it and he said, ‘By the way’ he said, ‘I’m new here and I’m extremely busy. You’ll get no help, you’ve just got to draw the jig. Go and get on with it.’ So I went and sat and I drew a jig and, er, right at the end of me finishing it they had redesigned the wing of the Princess to cope with the different engine, which meant the centre of gravity was in a different place and so on, so the wing had to be a different plan form. And, er, the foreman, didn’t call him the foreman, chief draftsman, chief tool draftsman, called me in and said, ‘You can file that drawing now. It’s redundant. Over there, just file it away.’ So nobody ever saw it and whether it still exists, I’ve no idea, but I filed it away with a big sigh of relief ‘cause to this day I’ve no idea whether it was any good or not [laughs]. And then, er, they sent me up to the stress office, which is where you’re responsible for the strength of the aeroplane. Sorry, I’m going to have to excuse myself, my coffee has gone through me.

*It’s a good time for a break.*

[End of Track 3]
Track 4

*In your – in the estimating department I was really interested in this idea of rate fixing.*

Well, all I can say is you – you visualise yourself making this component and, you know, I’d be doing – I’d be filing or I’d be operating a machine or – and you’d have to visualise yourself doing the job and how long it’s going to take, it’s as simple to describe as that really. Er, you can only do it if you know what you’re doing, otherwise you can’t, and that was the value of your apprenticeship and your going round the factory and observing what’s going on and so on. And, er, I was good at it and I have no hesitation in saying it, that I really did find it, not easy, I’m not going to say that, but what I learnt was good enough for me to be able to do it and do it pretty close to the right answer too, what’s more. Erm, I don’t – I’m not trying to say I was clever, not trying to say that at all, I’m really complimenting what I’d been taught, er, up to that time by all the various people I’d met and the good school and all the rest of it.

[01:50]

*That’s answered the question I had about rate fixing actually, so –*

You – you really did feel you’d become part of a good company.

*How were they to work for?*

Sorry?

*How were Saunders-Roe to work for?*

Er, it was just a very well run company. Erm, and you had things like interdepartmental competitions in football and cricket, and you had horticultural shows where you all competed. I won the photography prize four times, I’ve still got the cup because I won it outright instead of it being passed on. And, er, so it was – it
was a well-knit organisation, you felt a part of it, you didn’t – well, when I say you
felt a part of it, you didn’t actually feel part of it, you were a part of it [laughs] if you
can understand the difference that I’m making there, you know.

How did you talk to people outside the company about, you know, you working there?

You didn’t, no, you didn’t. You – you were … you just – they were two different
things and, you know, when you’re in you’re in and when you’re out you’re out.
You’d plenty of things in those days to occupy yourself in sport and what have you to
– you didn’t think about factory work when you were outside. They were – they were
just two different things.

Were you proud to work for Saunders-Roe?

Yes, yes I was, and that’s – have you seen my history books that I’ve done for the
company and so on?

I know if their existence but I haven’t read them, so …

Well, that tells you. You couldn’t write those books the way they are without your
feeling … proud of the place, proud to be somebody who’s worked for what Sam
Saunders created, and I do feel proud of it, yes I do.

What did you like about it? You’ve mentioned a few bits in passing but I thought it
might be nice to put them in one place. What did you like about Saunders-Roe?

Well, first of all, it was a good crowd. Everybody in the company worked pretty hard
and, er, when you were in there you worked, er, and helped one another. You never –
if you needed help and you went to somebody, even somebody you didn’t know, and
asked for help you’d get it. Er, it was a proper team place, well, it still is, don’t know
why I said was. As far as I understand from people still working there it’s still that
sort of place. Erm, it wasn’t – the place wasn’t the buildings, er, the buildings were
irrelevant, the place was the people in it. And the bosses were bosses and, I don’t
know, it’s just a good sort of family place.
Did it feel like that, like a family company or –?

Well, I don’t know that you ever sort of thought about it, you just accepted it for what it was. And if you were offered a job, as I was and later on anyway, if you were offered a job you – you automatically thought, do I really want to go? What’s this place going to be like compared with where I am? And, er, as it happened there were other reasons why, erm – I mean I really enjoyed working there and the interesting projects that we were into, erm, nothing else ever offered something better. So I stayed there all – all forty-six years and enjoyed, I’m not going to say every moment, that would be stupid, but I thoroughly enjoyed my working life.

Talking about working life and that separation, sorry –

Oh, I was just going to say, I must emphasise that the people I worked with were a part of that enjoyment, it wasn’t just the work itself, it was the whole thing and, you know, the – the team of people I had – whenever I was in charge of people they were always good workmen and pleasant chaps. I can’t think of one unpleasant bloke in my department.

[07:45]

There was one unpleasant bloke who was a director, that’s another story, but that was an exception.

Which is –?

And he didn’t – he came in from outside, he wasn’t one of us so to speak, and that – he didn’t behave like us, he was – for instance, this is a complete digression but trying to answer your question, erm, I was technical director at the time and he came in as the commercial director. And, er, he thought that when a visitor came to the company, erm, and he was doing commercial work, erm, he was his visitor and nobody else would see him. And I knew these people and they – they would want to come and say hello to me and they’d come into my office from lunch and we’d have a
chat, and this bloke after about a month, wrote me – wrote me a letter, and that was
the first thing I objected to, we didn’t do that sort of thing. Wrote me a letter saying I
wasn’t to do it, that it was his visitor and he – I wasn’t to see him, and so I telephoned
him and I said, ‘Would you please come by my office, I want to talk to you’ and so I
read him the riot act, I said, ‘First of all, don’t you ever write me a letter like that
again, come and see me and talk to me,’ just [makes muttering sound] that was all
right. And I said, ‘Secondly, I know all these people you’re talking to and I regard
them as friends, and I am going to see them and talk to them when they come. I will
not talk business to them, that’s yours, but I will talk to them about anything other
than what is your business.’ And I said, ‘I should be very careful about that but now
that’s it, I’ve finished, let’s go and have lunch but I will only repeat one thing. Don’t
you ever write me a letter like that again.’ He drank himself to death in the end, did
very – he was transferred to Yeovil and did stupid things, absolutely stupid things,

We can put a restriction this but I’m going to have to ask who it is.

No, I don’t – no, he’s dead and gone and everybody knows the one I – everybody
knows. No, I don’t need a restriction on that one.

Who was it?

Er, that you’ll have to turn off.

Oh, that’s what I meant, you know, we can put a restriction on it.

Oh, I’m not going to give his name.

Alright.

No. He was brought up as a – trained as a solicitor and, er, accountant, so remember
what I said about engineers?

[11:13]
[laughs] When you were going for this apprentice, I’m interested in this engineering mindset.

Yeah.

It’s got me thinking. When you’re going through the apprenticeship is there any sense of, you know, being taught to be a good engineer –

No.

And if so, you know, what is that?

No, you just are. What, you mean what is a good engineer?

Yeah.

Well, that varies from somebody who actually makes things to somebody who designs things. Er, the chap who makes things has to make them, er, as they’re intended to work, and they’ve got to be able to work properly so they’ve got to be made properly. And there isn’t any other in between, that they’ve either got to work properly or they don’t, so that’s your – that’s the objective of the – what I, just as a generalisation, call the man on the shop floor. Erm, as a designer it’s sort of the other end of it, that you’ve got to design something that is going to work and, er, work properly and work for a long time. And, er, there is no halfway house in that either, so – and that is something that usually – especially from like a shipbuilder or an aircraft company or something where you’re building a whole thing, your bit’s got to work with the bit the bloke next door’s designing. And similarly the chap who’s making something on the shop floor, his bit has got to work with all the other people’s bits. So you’ve got to work together and that’s what makes an engineer ‘cause you’ve got to know and work with all your mates on either side of you. You haven’t any choice in the matter, otherwise it’s not going to work, and I mean work in both the senses that I’ve been talking about.
Is teamwork an important part of it then?

Teamwork, yeah exactly, exactly.

How do you get good teamwork? Is it innate or do you have to work at it?

It was just – it’s just built up in you as you progressed. And, you know, this business of a bench with three people on it and on each side of it and, you know, how can you not work as a team? You just do it. And it was very friendly as well, you know, you – you had to get on with the next guy, you didn’t have any choice [laughs]. Not that it was ever quite like that but am I willing, am I getting across to you what I mean?

That’s just something that’s just innate in what you’re doing, then it’s –

Yes, that’s right.

It’s part of the process.

Yes, yes.

Would you say that was –? You mentioned that later on you were with some – when you were managing later on you always had brilliant teams underneath you.

Yes.

How were the people at the start? Was it the same then or different when, you know, you were a person of these smaller teams?

When I was in it?

When you were in it, yeah.

No, it wasn’t different, it was just as you used the word, it was automatic, you – you just did work together. You didn’t think of anything else, you were all there together.
I’m not saying that there weren’t arguments and don’t think that, for goodness sake. I mean obviously, er, you’d have an argument between the stress man who said that wasn’t strong enough and the – and the draftsman who said yes it is, and you – you’d have to resolve that argument.

_How do you resolve an argument like that, you know, between people with different expertise and different points of view?_

You just do, you just haven’t any choice in the matter, you’ve got to resolve it. You can’t walk away from it [laughs].

[16:05]

_Talking about stress men, you joined the stress office you said after – as the next stage in your apprenticeship._

Yes, and that – my stay in the stress office I regard as the happiest time of my life. The guys there were great, the work was interesting, and – but a lot of responsibility. Erm, it was a wonderful office to work in, it really was, nice blokes, and we had our own cricket team and, you know, I mean the interdepartmental and all that sort of thing there. And the – towards the end when, erm, a fighter aircraft we were doing was cancelled and half the workforce went – half the team went, mostly across the Atlantic, but some – some not, the – the bottom temporarily fell out of it and I was promoted and I – but I still look back with pride and, erm, pleasure on that time in the stress office and the team, they were super.

_Could we break this down a little more? I know what a stress office does but lots of other people don’t –_

No, that’s right.

_Would you mind explaining it?_
Well, we’re responsible for ensuring that the, erm – and in the process of making sure it’s strong enough you automatically have to ensure that it’s going to work as well, because otherwise you can’t stress it, you can’t – ‘cause, erm, stress it, make it strong enough. If you can’t make it work you can’t make it strong enough can you? Do you see what I mean?

*Not quite.*

Not quite. Well, if you’ve got a machine you put a load in it which would come from the engine, er, and you put that load into it and then you’ve got to trace right through the mechanism how that load goes from one bit to another bit to another bit, and make sure each of those bits is strong enough. And in doing that you can only do that if you understand how that machine works, and that it does actually work. So it isn’t just a question of saying it’s strong enough, it’s got to be right as well, so you’re – you’re actually totally responsible for that thing that it – that it works properly and that it’s strong enough, and it meets all the regulations of – that are laid down by the Air Registration Board or whatever the authority there might be that sets down the requirements of whatever it is you’re doing, that it should be able to – for instance, a simple one is that you design an aeroplane to fly into an upgust of fifty feet per second or sixty-six feet per second or whatever, and that it – the loads on the machine, having done that, don’t break it up. So you have to calculate then all the loading and so on through that motion of the aeroplane. And similarly a ship, when it’s sitting on top of the waves, that it doesn’t break up, or when it smashes into the waves and odd things like does a big flying bird hitting the windscreen, is it going to fly in and kill the pilot? There’s all sorts of things like that which you’ve got to make sure that vehicle is strong enough for the job.

*Are you doing this on a sort of system wide basis then –?*

Yes.

*So stressing an entire plane or –*

Yes.
Is it the bits you do and work up from it?

All of it, all of it. You know, one stress man might be doing the overall loading and so on, and he passes onto somebody else who’s, you know, making sure a component is strong enough. He tells him what the loads coming through are and so on.

What were you stressing?

Oh, all sorts of things, gracious me. Er, we were doing the Princess flying boat and, erm, the SR53 mixed power unit fighter, and those were – those were things we were actually building but then there were all the other things they were looking at, er, like flying boat designs for NATO and New Zealand and all sorts of other things where you were just doing the overall things and not the detail. And all that was going on all at the same time, project after project, submarines and all sorts things that we were doing.

Are there any you can –?

Amazing actually [ph], what we were involved in.

You’re covering your mic actually.

Oh.

Were there any you found particularly interesting?

All of it, every single one was interesting in a different way sometimes but, er, we’d have – I had a [laughs] – I had this argument on one of them with the chief designer, there was a chap called Morris Brennan at the time and, erm, he wanted a very high aspect ratio wing on this flying boat we were designing. I think that was the – no, it might have been – I don’t know, it was designed anyway, supposedly capable of landing in the mid-Atlantic and [laughs] I thought this idea of a very high aspect ratio wing which would obviously be flexible if it was a – a high aspect ratio wing means
that it’s long and thin, I’m sure you’ve realised that. Erm, if you can imagine that sort of wing out in the middle of the Atlantic flapping up and down, I thought it was daft and said so [laughs]. Oh, dear, I’m afraid this was my father’s bit that, you know, if you – you had to say. You didn’t have to be horrible about it but you had to say what you thought. And, er, we had quite an argument and he wouldn’t have it, so it went out with this bloody great high aspect ratio wing, which I thought was absolutely crazy, but still, there we are. But that’s the sort of thing you’ve got – and we still remained friends, he didn’t – you had a technical argument, you could differ quite violently, but it didn’t alter the fact that you were Ray and Morris.

[24:35]

*How does one actually stress a component of the plane?*

Well, you – you work out what the loads are imposed on the whole thing, and then those have to be then interpreted to every component. So you’ve got to trace that load right through the aircraft, or the same thing with a ship, although they don’t do that in so much detail as – as we did on aeroplanes, or do on aeroplanes, because a lot of the ship design was a convention, whereas an aircraft, each one was an individual thing. And you had to trace those – suppose you had to estimate all the pressures on the wing and make sure that added up to the total wing loading that equalled the weight of the aircraft, er, and if it hit a gust that weight of the aircraft would, as it were, double or treble or whatever, and that had to be worked back through all the loads and that had to be worked into each individual component. I mean my very first own job in the stress office was a great big strut, er, as high as this here [demonstrates].

*About six foot tall.*

Yeah, and make sure it was strong enough. And it was a funny shape, it was like that [demonstrates].

*Could you describe that?*
I don’t know how to [laughs]. Er, well, it was – the basic bit you call a channel and then you’d say it was a flanged channel, and the flanges were flanged, er, so it was smaller and smaller flanges, and that was so that it didn’t collapse in compression, so it’s stabilised because you’re making it out of fairly thin metal. And then that would be riveted to an angle that went across the cord of the wing, and I had to make sure that was strong enough and I had to test it and then find a method of forecasting the result that you got from the test, or do it the other way round, and so there was this big machine about twenty – with two platens, one above the other, between four big long struts, erm, with a hydraulic input from a jack, hydraulic jack, at the bottom that would push the plate which was, oh, twenty inches by ten inches, something like that, and would push that up and compress the strut. And so the bottom of the – the bottom platen, as we call it which had the jack below it, was at about chest height or a bit lower perhaps, and then the four big struts went up into the ceiling and with another platen at the top. And you had to position the strut precisely with little plates, erm, at the top and the bottom and then compress it. I had a workman under me, believe it or not, still an apprentice and, erm, he operated the hydraulic machine, hydraulic, erm, compressor. And he opened – opened it up to allow everything to expand and I was – I’d fastened the bottom of the strut onto the platen at the bottom and was up a ladder fastening the top in. And he was operating the – the hydraulic machine to raise the platens so they came together, and unfortunately for him he opened it too wide and [laughs] and the thing just went up and compressed the strut, pushed – the strut failed in my direction but it bowed in my direction, pushed the ladder off and me off it as well [laughs] and completely wrecked the strut. So that all had to be done again but fortunately I was okay, I was a pretty athletic person and I’d managed to jump off backwards and I was okay but, er – and then he apologised of course and so on but that’s just one of these things we had a good laugh about it, erm, and then we set off and did the whole thing again with another strut, but that’s the sort of thing. So then having got those answers I had to check that against my theoretical calculations, which I didn’t know how to do, so I was given a book by the chief – the senior stress man I was working for, a chap called George Thompson, and we became very close friends and he became chief and eventually I took over from him. But, erm, that’s how – he didn’t instruct me, he said here’s a book, now go away and work it out, and that’s what you did, and that was a young man of about twenty. And that was quite a responsibility really, I mean that wing strut had to hold that wing together.
Was it something that weighed on you at all?

Not in the slightest, no, you just did – you did what you were told and get on with it [laughs].

Is there much, or how much mathematics is there involved in stressing?

Oh, a lot, oh yes, yes, oh yes, you had to be pretty good at mathematics. Not everything, I mean some of it was relatively simple.

Could you give me a flavour of how much it’s –?

Sorry, how?

How many calculations would you have to do for, you know –?

Well, it varied. Er, I mean if you were talking about stressing a – making sure a fuselage that’s cut for a ramp to load up with or – and there’s holes in it and all that sort of thing, that can be a very complicated thing to analyse, what – where the loads are and what the resulting stresses are. And then there’s the other end of it of course, is having calculated the loads you’ve got to calculate whether the thing is strong enough or not. Er, that involves totally different calculations like this strut, for instance, but before that you’d done the whole wing and whether it was strong enough when it bent. And that – those involved quite difficult calculations of analysing a whole structure as distinct from just saying whether this component is, er – is the pin through this hole, is that pin strong enough? And don’t forget, there’s two aspects of it. One is, what is the loading on that pin, and the other is, what load can the pin take, and what material is it made of, and what stress can that material take? And, er, then is it a different material that might corrode adjacent to this other piece of material that it goes through. And so you’ve gone from – from, right the whole overall structure, right down to a pin and what it’s made of. I found that terrifically challenging and
interesting, and so you – anything from abstruse mathematical calculations down to,
er, the actual choice of material and would it corrode and would it this and would it
that. And I – I found that – and I could not understand why so many people wanted to
do aerodynamics and all that sort of thing, which I found it ever so easy. [Laughs]
Anyway so –

What was the attraction? Bearing in mind I’m somebody who hates maths and will
need this spelt out for me quite simply, it sounds –

Oh, well, you’ve got the maths whether you do air dynamics or whether you – no, you
can’t avoid that, you’ve got the mathematics either way. Erm, but no, you’re stuck
with mathematics, there’s no doubt about that.

[34:44]

Did you ever –?

What was interesting was the machines that we – when I first began it was – in the
sixth form it was log tables you did your calculations with. Erm, when I got into the
stress office most of us used a slide rule, which is the same thing as using logarithmic
tables really, exactly the same, erm, adding and subtracting instead of multiplying and
dividing. But then, er, the first introduction when I was probably in my mid to late
twenties was a machine called a facet where you rotated discs against one another, a
series of numbered discs, and you had a – the display was just the series of digits and,
er, you wound it up one way for this multiplying and another – the other way for
dividing and – and they made quite a racket actually. And then we got the same thing
motorised, erm, exactly the same only electrically driven. And, er, then you had to be
careful that – to align the digits you were multiplying by and if you – if you didn’t
align them you – the machine would just keep going at a terrific rate and wake
everybody else in the office up. And we calculated that if you set up a number to be
divided by another number and that you – you used up the – I think they had twelve
digits, and if you set up – instead of lining up the digits you were dividing or
multiplying together, instead of lining them up you did the opposite then made them
as far apart as you could. We calculated if you did the maximum you could do on the
machine it would take a year and a half to do the job [laughs]. So just imagine this machine whizzing away for – waking everybody up for a year and a half [laughs].

*Did they improve the job compared to –? Were they an improvement over using slide rules or –?*

Well, it was more accurate of course, ‘cause you can only set up what you can see, which is three figures if you’re lucky, two definitely and a third maybe. But that was good enough for most things, I mean an accuracy of one in a hundred was – was good enough for what you were doing.

[37:50]

*You mentioned that you got on well with the other people in the stress office. Who else was there?*

What do you mean, who else was there?

*Well, who were the other people in the stress office?*

Well, they were people with – the lowest qualification was a Higher National. I suppose half of the office was qualified to that level and they’d done apprenticeships and – and so on, that was most of the office. The others had degrees, er, some had apprenticeships, some had postgraduate apprenticeships, and one or two had neither, they just had a degree, and that was an exception rather than normal. But Higher National was the lowest qualification for being in the stress office. Erm, as I say, most of them were apprentices, had been, but they were such a decent crowd. You know, we would always be chatting or, erm, as I said, playing in the cricket team or … nobody worried how good or bad you were at the game, it was all fun. And, you know, we were all in it together in making this aeroplane strong enough.

*Any workmates you remember in particular?*
Oh, yes, behind me was a chap called Albert Weeks who later on became my deputy and I made him chief engineer. Er, we got on like a house on fire, both in work and out of work and there were – there was George Thompson who became stress man. The stress man, chief stress man, at that time was a chap called Fred Kerry who was the trustee of the Methodist church, great friend of my grandfather, and who was responsible for me joining the trustees and taking his job as treasurer, which he duly handed over to me. I shall never forget the first – the first job as treasurer, God, it was a summer fete for getting money and, er, at the end of the fete this chap who was organising the fete brought all the money to me to bank. And there was this huge bag of pennies, the big old fashioned penny coin, and I didn’t realise that what I should have been doing was counting these into pound coins or whatever and put in little bags and taken that to the bank. But instead of that, I took the whole lot down with me, all counted out all and separated into bags, but big bags [laughs] and, oh dear. So I get down to this little office down in the town, er, and handed this over to the chap behind the counter and I said, you know, I wasn’t sure what I was supposed to do, this was my first encounter to large quantities of money. And he said, ‘Oh, that’s all right Mr Wheeler, I’ll see to it.’ And he picked up this bag, it was in an ordinary brown paper bag like that, sort of almost a foot across which he picked up, and as he picked up the bag split and the coins went everywhere. And there were other people standing behind me in the queue and there were these coins, oh dear, everywhere [laughs]. ‘Don’t worry Mr Wheeler, we’ll get them all’ and we did – I did, I – whether I went red or not I don’t know but oh dear, I was so embarrassed by this. But that was another lesson learnt, that you – that you go and talk to somebody first and find out what you’re supposed to do [laughs]. Oh, dear.

I'm going to have to change the card in this in a second –

That’s all right.

But before I do I was just going to ask, what’s life like outside work at this time?

Oh, this is where I was busy with the Boys’ Brigade and playing football for the company apprentice team, and running for Hampshire and, er, dear me. And my – have I mentioned the fact that there was two in the science sixth form, I have haven’t
I? Well, the other half of the science sixth form lived at Niton, almost next door to where the commandoes during the war, er, used to train.

[43:30]

And they were terribly careless with ammunition, PIAT bombs, which were anti-tank weapons which were sort of almost – well, they were rockets. And even a machine gun, they left a 303 machine gun, Bren gun, down there which we fired all over the place before we hid it under a hedge until it got a bit rusty and then – then claimed we found it. But we continued to set off, er, explosions under rocks and blow them up in this place where I’d explained to you earlier about the cliff at – the under cliff on the south of the island. Erm, so you had this sort of area where the – you got a cliff above you and then a total, er, area of rough ground where they did their commando training, but they hadn’t – when the war finished they’d left but we still went down there setting off explosions and – and what have you, blowing up great big rocks and so on.

*It sounds quite –*

And I’d cycle from the fifteen miles down there and back after we’d been clambering over all these, so you can imagine how fit I was. And, as I say, there was the – all the sporting things and swimming, erm. A very busy life and a very enjoyable life indeed apart from too much bloody work to do, as I’ve already described.

[End of Track 4]
Track 5

*In your time moving between the different departments during your apprenticeship, were you still continuing to go to University College Southampton?*

Oh yes, oh yes, and always on the works side. I was expected to make whatever I was making in the same time as if I had not been going to the university, which made life very hard. But I was able to do it, which I’ve no regrets about it. It really did mean that when I got to full time work mine was comparatively easy compared with the – I mean I’m really serious. I worked my socks off and I enjoyed life, you know, with the Boys’ Brigade and football and cricket and swimming and running, and … life was good.

*What was Southampton College like?*

The only person who was below standard was the, funny enough, the, er, chap who was responsible for structural engineering, and he really wasn’t up to the job. That’s one of our prowling cats just coming through there. He – and as I think I’ve already said, he would often call me out, and this is the final year I’m talking about, to help him to, erm, conclude what he was doing. That was – I was amazed how much I had actually learnt in the stress office, I really was. I’d got to degree level in my short time in the stress office, largely due to George Thompson who was looking after me.

[02:10]

*How did he look after you?*

Well, giving me reference books and telling me – giving me jobs that involved both the overall thing that I was talking about, you know, the bending moments and sheer forces, etc, on the wing and the fuselage and the design cases and how you worked it out and – as well as the detailed design, he’d given me the whole picture.

*What was he like? Can you describe him to me?*
Now what was he like? He was a bit like my school masters at the school in, er, he’d never disciplined me at all, he would just treat me as an equal, I can’t describe it any other way to, and we – he persuaded me to be a navigator for him in car, road competitions, where you have to – and I was his navigator and we did very well in competitions. And he just asked me would I join him and I thought why not, you know, a bit of fun, and so it was. He treated me as an equal I think is really what I’m trying to say. He never – never really sort of imposed himself as a teacher on me at all and, er, largely left me to it. And if I wanted anything I’d just go and ask him if I wanted help, which wasn’t very often, it was just good, nice guy. Another one of my friends who’s left us, unfortunately. I think that’s one thing about my life that I do have a regret about, that I got promotion young and so I was going through my colleagues and, er, then eventually when I became chief designer all my chief electrical engineer and my chief mechanical engineer were all older than me, and as a result they haven’t survived me, they’ve all gone, almost without exception, in fact without exception, so they’ve gone – all my pals have gone, and even my bosses of course were older than me and they’ve gone. There’s one or two of my colleagues left but not many, but I’ve made new friends so it’s just the way life is.

[05:30]

*Talking about the relationship between the stress office and the University College Southampton bit that – do you think they overlapped at all?*

No, they never even talked to one another. No, there was a distinct complete difference, yes.

*What about things you were learning, did they overlap or –?*

Oh, yes, oh they did, yes, definitely. But the course at Southampton was practical, worthwhile.

*What sort of things were actually part of the course?*
Well, let’s see, what were the subjects we did? Aircraft structures we did, aerodynamics, erm, we didn’t do much electrical engineering in the final year, we had done it before. We did mechanical engineering, erm, we did maths of course. Erm, we did a lot of testing in the wind tunnel and in the structures lab, and we did aircraft design. That’s about it I suppose.

*Any bits you particularly enjoyed?*

All of it, yes. Erm, I enjoyed the structures bit but I found that ever so easy, I’d – I was ahead of it if anything [laughs], but even aerodynamics, having had to work out the loading on the aircraft, I’d done a lot of aerodynamics as well, so – but there were detailed aspects we hadn’t done and in retrospect we should have been told, look, this is your London University syllabus and we will cover this, you need to do private study in these particular things. And unfortunately for us we had never been told that, we assumed we’d covered everything, and in aerodynamics, and when we had our examination papers set by London University, not by our tutors at Southampton, there were – we couldn’t answer all the questions, we didn’t know what a – for instance, one question was something to do with a fugoid oscillation, which we’d never even heard of, you see. So that aspect of it – instructors were okay, we did cover it all anyway, but we should have been told that and we weren’t. And there were three of us expected to get first class honours and we didn’t because we – we didn’t fail the aerodynamics paper but we weren’t high enough up to – to get a first class so we got a second class degree, which I was a bit cross about because I knew we were good enough to be first class students and as you’ve seen, the standard of work we did was very high. I mean can you imagine how many students straight from school could do the drawings like those? Not very many, if any.

*How was the quality of the teaching?*

Apart from – with that one exception, very good, very good indeed.

[09:45]

*Any teachers you remember in particular?*
Erm, yes, don’t ask me their names for goodness sake.

*Maybe not their names.*

The one I remember, Alford, was the structural one of course. Toss Tanner, he did aerodynamics. There was – the aeronautics professor was Cave-Brown-Cave, who used to talk to us about the history of aviation, which was quite interesting, and we were not examined in that at all and I, er – he wanted me to go on to Cambridge University as a postgraduate but I’d heard that Imperial College was better and offered more courses and what have you so I did – I didn’t do what he said, I went to Imperial, and I don’t know whether that really was the best decision or not, ‘cause of course I don’t know anything about the Cambridge side of it [laughs]. All I know is I learnt a hell of a lot at Imperial.

*When did you finish in Southampton?*

Southampton was not – was when I was twenty-one and I finished my apprenticeship, so twenty-one was 1948. And, er, in the summer of – in the early summer of that year, no the year before, I’d obtained a Spitfire memorial scholarship that lasted for three years, so that funded my first two years at Imperial.

*How did you get a Spitfire scholarship?*

I had to sit an exam and a tough interview. I had to write an essay about the future of flying boats, which I thought then was going to be – it seemed such an obvious thing from all sorts of aspects. And I even thought of the safety of it at that time, would you believe, and that still as an undergraduate, that most of the capital cities were either on or near water and that the obvious thing to do was to use flying boats. It seemed perfectly obvious to me but things have changed, there are so many airports now that are not on or near water that land planes won the day. But I think that’s a shame, and I still do, and I still think there’s room for flying boats.

*Is flying boats something you’d worked on during your apprenticeship as well?*
Well, yes, on the Princess, yes. And I helped to take the SRN A1 flying boat fighter. I helped to take the hull out of its jig. That’s when I was in the tool room, and that was another incident I’ve suddenly recalled when I was in the tool room that is of interest. Erm, I was known in the – in the tool room as Hawkeye for, why I have absolutely no idea, erm, and it came from lining up the – the jig for the hull of the first Princess, and that was a big, er, iron I-section beam that stretched the length of the Princess. And the hull was laid up on it, so that had to be laid very accurately horizontal, and I was grabbed by one of the senior tool room men and off we went to set this up absolutely dead straight and horizontal. And, er, he made me do it with a, what was called I think, a collimator which you sited along the beam and it told you whether it was horizontal or not, somehow or other, I can’t remember the details. But anyway, we set it all up and washed our hands of that and went off, and were summoned by the inspection that it wasn’t set up right, it was wrong, go and sort it out. So we went and set it up again, and again we were told it was wrong. And, er, great big intelligent Ray Wheeler decided that the floor must have moved and – which created great laughter and I said, ‘There’s no other explanation’ I said, ‘you do it, you go and site it up.’ And, er, there was a lot of chewing and humming and hahhing and eventually we decided it must be the tide moving the floor, er, and it was. We set it up at low tide and high tide and it moved, erm, and I suggested that what we ought to do was cut a channel in the floor of the – of Columbine hangar and build the – build the channel into, erm, what do you call it where you build ships? In a – in a, erm, what do you call it when you build ships in a –

*Dry dock?*

In a channel and then you flood the channel to take the ship out?

*Dry dock?*

Dry dock, can build the ship in a dry dock in the middle of the – no, they didn’t like the idea of that much, er, but with a hollow wing it would have been perfectly feasible. But anyway, so we – we set it up at mid-tide and just bore with the slight discrepancies at high and low tide, erm, and that was one of my first jobs in the tool
room, not my first but one of. But you wouldn’t believe that huge concrete floor bending up with the tide would you? But it did, it did.

[17:34]

You mentioned, talking about flying boats a little while ago, saying that you thought, you know, they still had some future –

Yes.

In the 1940s. What did you actually think the future was going to be for aviation at that point when you were starting your career? Any sort of aspects of it you thought would be –?

Oh, I didn’t doubt for one minute, the horizon was wonderful, it was going to expand and get faster and further and bigger, and funny enough we – later on, erm, we did a heck of a lot of work for P&O on a 1,000 seater flying boat, which nearly happened, and that would have been slightly bigger than the Airbus 380, all those years ago.

Why didn’t it happen?

I have no idea, it was never – we were never told, we never got an order for it, that’s as simple as I can say and I wasn’t at a level that I was talking to the company then, so they just, I presume, went on with other things. Somebody in it had this great idea and it didn’t progress.

So you won the Spitfire scholarship.

Yes.

And that paid for what exactly?

Well, it paid all my fees and then in those days you – if you got a scholarship you went to your local authority and they paid you an allowance, er, for upkeep depending
– which depended on your father’s income, which wasn’t very high, so I did quite well. But there were one or two others who were quite clearly better off than me, er, who got a bigger allowance than I did because somehow or other their accountants or whoever managed to show a lower income than we did, ‘cause we couldn’t afford an accountant to – so quite – a completely honest statement went in from my father, but that – and it was sufficient. I couldn’t go into a pub and order a pint mind you, didn’t have enough for that, there was no student shenanigans like you hear of today, ‘cause we couldn’t afford it. No way could I – I couldn’t afford to go into a pub and order a drink until I was in my late thirties, with our children and cost of living and so forth, so it’s something I never learnt, which is probably a good thing [laughs].

So you left the Imperial College. Was there any sort of entrance examination or interview?

No, no, nothing, just my degree and – and the scholarship.

When did you actually start?

Er, well, in October I suppose, 19 … 48 would it be, ‘48 or ‘49, I’m not quite sure which immediately, erm …

Why did you –?

It must have been ‘48.

What were the things that you liked about Imperial? Why did you choose to go there, I mean, sorry?

Oh, because I’d been – I was told what postgraduate courses were available and I’d heard of Hadji Argyris that he was going to be employed as a professor. And the boss, professor – gosh, what was that professor’s name? He was an ex-scientist from Farnborough, very well known for supersonic work, and he’d just been made Zaharoff professor of the aeronautics department of City and Guilds College, one of
the three Imperial Colleges at the time. And his reputation was worthwhile following, so off I went.

[22:40]

*So which actual campus were you based at?*

Oh, City and Guilds College, er, which was what – Imperial College at that time was the Royal School of Mines, which – and then going towards the Thames was City and Guilds College, which was engineering, and then further down was the Royal College of Science, which that’s sort of, as it were, going down Exhibition Road. And those were the three constituent colleges you were in. And then each of those colleges had their own departments for various reasons.

*But based at the City and Guilds?*

Yes.

*What was it like? Can you describe the building to me?*

Well, it was – all that whole area was built after the Great Exhibition, including at the bottom going towards the Thames, at the bottom of a slight hill going from Hyde Park towards the Thames, erm, which I’ve described as three colleges in that way. And then the next building below the colleges was the, erm … Science Museum and then the Natural History Museum, and that was the big block that was part of Imperial College. Sorry, does that answer your question?

*I was just wondering which particular bit of – what was the particular building you worked in looked like?*

Oh, you’re asking me what – well, they were all built, that whole block was built in the sort of mid to – mid to late nineteenth century, Victorian buildings. They’re still here, nothing very special about them I wouldn’t say. The one that really had a bit of character about it, which it still has, is the Natural History Museum of course, which
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goes across … I can’t remember the name of that road that goes across the bottom, east west. No, I can’t remember it. Gloucester Road?

Yeah.

I think it’s Gloucester Road, I think it’s Gloucester Road. And, erm, eventually I had digs in an old hotel that straddled the District Line and our bedroom with five of us in it looked westwards straight along the District Line. And on the first night, I got into bed and I thought, God, I’m never going to sleep with those bloody trains, but I did and I never had any trouble sleeping. Er, and there were five good guys and a medical student, a Kleeneze salesman [laughs], me and I forget the two others.

Five of you in a room, that’s –

Pardon?

Five of you in a room.

Oh, it was a big room and, er, four of the beds were one above the other and I can’t remember whether I was in a top one or bottom one. Didn’t make any difference, I slept like a log, I always have fortunately, touch wood somewhere [laughs].

[26:50]

But what were conditions there like in the lodging house?

Oh, they were okay. The food was good, it was reasonably cheap, I could afford it and still have money left to, er, play foot – play soccer and go on trips to – the furthest we went was Exeter I seem to remember. I played – played soccer there. At Southampton I played hockey but I got badly injured so I thought I’d play football, go back to football at Imperial. Got my full colours and – and, erm, became vice-captain of the team.

What else did you for fun while you were at Imperial?
Erm, I was pretty busy and in holidays I went back to my – I was still employed by my company on paper, and I went back and worked in the stress office every holiday, Christmas, Easter and summer. I didn’t have what was conventionally called a holiday at all, couldn’t afford it, and – but I mean the time on the island, I was able to enjoy myself back with my pals in the stress office and, er, that was like being on holiday, no work to take home or anything, so no complaints about that.

*What did you study at Imperial?*

All aspects of aeronautics and maths and helicopter design and, er, I was sent – I was sent to, erm, LSE, London School of Economics, to – and go through the final year of the course there. And, er, it was so easy I didn’t think – see anything worthwhile about applying for a degree, which I could have got an economics degree but I thought it was [laughs] – I couldn’t believe it when I went into the first lecture and they talked about the pyramid structure of organisation of a company and how the maximum that any one person could look after any other people, the maximum was twelve, and therefore you have twelve people with one above and twelve people with one above and so that – and then this went to twelve and then up, and then this went to twelve and up [laughs]. And I thought bloody hell, how difficult that is [laughs]. But I stuck it out and I did do the course, but I stupidly didn’t take the exam, I still can’t think why, I just thought it was a waste of time [laughs]. So much for engineers relative to, erm, managers and so forth.

[30:40]

*On the Imperial College side of it, what degree were you actually registered for?*

Oh, erm, the – after two years of postgraduate work and lectures you didn’t do any specific experimental work, you got what they called an Imperial College Diploma, erm, DIC, Diploma of Imperial College, which was equivalent to a master’s degree. And then I did my research bit which hopefully was going to lead to a PhD but my professor, Hadji Argyris, I think wanted to set a very high standard for – for his first PhD students and he wouldn’t award me a PhD and said there were various things I
hadn’t done which I could have done, which was true, and insisted on awarding me a master’s degree, which I was a bit bitter about, I must admit, ‘cause he hadn’t helped at all and I think he should have done, but that’s just my opinion. He was a very bright chap, or is for all I know, I don’t know if he’s still alive, he – he would have been thirty-five or thereabouts when I was thereabouts twenty-five, so ten years older than me would make him ninety-three, so …

Possible but unlikely.

Possible but unlikely, yes.

Can you describe him to me?

He came from East Europe somewhere, I don’t know – I’m not an expert in the religions. If you’re a Hadji haven’t you been to Mecca?

I think so.

I think – I think so. So, erm – but he was Hadji Argyris and that seems to me Turkey maybe or, I don’t know, I’ve never gone about finding out. Erm, but he was quite clearly from that sort of area of the world, erm, a very good lecturer, exceptionally good lecturer, I thought. A hell of a contrast to the structures lecturer at Southampton [laughs]. Erm, and – but apart from that occasionally saw him at a party maybe twice a year, maybe once, and he didn’t talk much, erm, didn’t really know him as a man. As a lecturer one of the things he did, which I didn’t – I thought I could – I mustn’t say I didn’t like ‘cause that’s not – that’s not true, I thought he shouldn’t do, but he would pace, you know, the – a typical college lecture theatre is on a slope and he’d walk from the one corner of the – where the students were, down the steps, across the front and up the other steps, and he’d be continually doing that in between writing on the – on the blackboard, and I didn’t think he should do that. Up and down the front, fair enough, but if you were taking – trying to write notes and you were turning your head to follow him, not a very good idea really. Anyway, that aside, he was really a first class teacher of advanced aircraft structures, very good, I just wish he’d been a bit more help to me in getting a PhD. But he was all over the place, he was in demand
in Canada and Munich and various places to help set up structural research. Still … I learnt a lot at Imperial College what is in retrospect that – what twelve years later I suppose, I might as well have thrown it all away but [laughs] I was too busy managing other people’s design. Under me of course but – so at least I knew what I was talking about [laughs] but all that detailed work had gone out of the window.

[36:25]

You’d already done a BSc in aeronautical engineering?

Yes, yes.

What did you gain from the two year taught part of the Imperial course over the qualifications you already had?

Oh, a lot, a lot more, much more advanced work. For instance, we did helicopter design which we hadn’t touched. Erm, much harder analysis of structures, erm, a lot – a lot more about supersonic aerodynamics, even – I’ve forgotten the word for it now. Erm, not supersonic, the next stage, sort of –

Hypersonic?

Twelve, about numbers of twelve, you know, that sort of thing. We had a lecturer over from the California Tech teaching us that, so pretty – pretty much more at a higher level of everything.

How was it taught?

Oh, blackboard. The interesting thing was the exam at the end of two years. We had two papers, one was a straightforward ordinary exam paper, and the next one was a much higher level and you could use your textbooks. You could take anything you like into the examination room, all your notes, textbooks, anything you wanted, computer, anything, so –
Computer?

Well, you know, a small hand computer, I mean …

Slide rule or –?

No, didn’t bother about – no, it’s on here somewhere. In fact this is it [shows item], that sort of thing we were allowed to take in.

But do you mean later on or …?

Oh, I think it was then, they were very – they were very – they were big, they –

Mechanical though or –

Yes, yes.

Right.

You – and you could take your slide rule across but you were able to do that with any exam in those days.

Did you have practical elements to this as well or was it all theory?

No, it was theory, most exams, yes. No, nothing – nothing practical. Erm, we were expected to produce a thesis which – and you could combine with another student if you wanted to, so two of us did an aircraft design as our thesis where we got – went down to quite detailed systems and things like that in it. So that was the only practical bit I suppose you could say but nothing – didn’t – you didn’t do work in a wind tunnel for the exam or anything like that.

How much –? What was the workload like?
Er, I didn’t find it very hard. Er … I suppose I’d been through it before all that, I’d been through the hard work bit then I didn’t find what others called hard work, hard work at all. And, er, at the end of – at the end of the second term, at Easter in my first year, I was married to Jean, so, er – and we set ourselves up in a little flat in north London and lived very happily. She got work and I was, erm, an allowance in her income tax [laughs], which amused her and me very much. But we lived very happily, we invited friends in and Jean managed to give them a meal, because we were rationed then still, but she charmed the local butcher and the fishmonger and I’m sure she got a lot more than we were supposed to get [laughs].

[41:30]

*What was your home like?*

It was a great big room, bigger than this, er, with a double bed in it and these chairs, these actual chairs, erm, and a small kitchen and next door a communal bathroom, very comfort – lovely views from it. We were on the first floor at the top of a slope and, er, we had a very happy life there, going to shows and so on. As I’ve explained I didn’t – I didn’t find I had hard work to do, I found it a piece of cake [laughs] ‘cause of what I’d been in before, been through before, but they were very happy days actually, very happy days indeed.

[42:40]

*So you did two years of being taught basically the diploma –*

Yes.

*And then chose a research topic?*

Yes.

*What did you choose to research?*
Analysing what’s called an open section structure. Erm, a structure – it was probably about … six feet or maybe a little bit more long, with a big, erm … slab if you like in the middle so that it was like an imitation bit of a wing with the – this big slab in the middle, er, was where the fuselage would be. And it was an open section, in other words, the bottom of it didn’t have a plate, it had a plate on two vertical sides and the top and nothing across the bottom. And you had to test that in torsion and in bending, er, simulating what we’d call the built-in end which was in the – in the centre, so – ‘cause the whole of the thing was balanced, so you were loading it at both ends identically.

*Like loading a substitute wing at both ends?*

Yes.

*Right.*

And, er, I had to predict the – I had to stick all the strain gauges on, I had to make the, er, strain measuring thing work, which it didn’t, and that’s not a complaint, that didn’t do me any harm. I had to help Tipsy Aircraft out in west London, near Heathrow, make the thing in the first place, erm, because a lot of it was stuck together with glue to avoid slippage of the joints that you get a bit of with rivets and, er – well, I remember I mixed up the first, er, mix of what was called in those days araldite, which is a very super glue, erm, and I got out of the station at Heathrow and the container was too hot to hold and I dropped it onto the runway one when I got out of the underground and, er, had to go back and do it all again. But, er, I did all that, erm, and then I had to put a big steel tube through the middle of it and see what difference, especially in torsion and twisting, that that made. And, er, I felt I had to modify our Argyris’ theories on the subject but he wouldn’t have it that they needed modification. But nevertheless, my modifications correctly predicted the stresses so I tried to argue that at the interview but I didn’t get anywhere and, erm, I was awarded a master’s instead of a PhD. Still, that’s all it was and that’s what it is, so … and that was the end of me at Imperial College.

[46:30]
Did you have any, you know, particular reason for doing the PhD? Were you planning on an academic career or going back into industry or –?

No. No, as I said to you, I was going to be the, er – in whatever business I was in, whether it was academic or a company, I’d be the most knowledgeable aircraft structural analyst that there was in England, that’s what I was going to be.

That’s quite an ambition, how did you arrive at it?

It was, it was. It wasn’t very specific, you know, I just wanted to know it all, and that applied to materials as well, the materials that it would be made of, so – and that was a bit of a subject in the postgraduate work at Imperial, materials.

In what sense materials?

Very important subject.

Can you not cover your mic, sorry it’s left a –

Sorry.

It’s all right.

Well, there’s all sorts of things. For instance, er, some high grade aluminium alloys, er, would suffer from – if they were stressed for too long a period they would corrode, it would induce corrosion, which would in itself, of itself, accelerate the failure of the component in addition to the basic fatigue, would make the fatigue worse. Er, and you to know about that sort of thing and others, the … induced, erm, level of … in volts in electricity that would be generated by two different metals put together and whether it had a copper alloy in the aluminium or some other, or zinc or whatever, the effect would be different. But, er, if it was going to get condensation on the joint between that and steel, for instance, you could have a very high level of corrosion. So all those factors, er, affect the choice of material and then there’s the fatigue to
consider, how susceptible to fatigue the material was, all these things were involved in the choice of material that you would make the aeroplane of. That’s quite – quite a common thing to know these days but it wasn’t then.

*What do you think the most important things you learnt in your time at Imperial were?*

Er, just how – well, that material bit was very important, er, but also how to analyse advanced structures. What we didn’t do, I felt enough of, is, that I had done in my very first job in the stress office, which was what load the structure could sustain, not – not what it was subjected to but how strong was it, and that wasn’t dealt with enough I thought. That’s the only criticism I would make. It was dealt with to an extent like how strong is a strut, erm, but other more detailed things weren’t dealt with.

[51:05]

*Had you had much thought about what you wanted to do in your career afterwards?*

Oh, I was going to be chief stress man, oh yes, and, er, design aeroplanes.

*At Saunders-Roe or elsewhere?*

That didn’t enter into it really. Erm, I thought of going to Farnborough but they weren’t employing people at the time, so I didn’t go there. And other aircraft companies, where they were didn’t attract me at all. I mean you – you had the big ones in the north of England and you had one north of London and, er – but I was still attracted to sea planes and the different variety of work that I’ve had at Saunders-Roe and different sort of aeroplanes and so on was very attractive, so back I came.

*Where did you go back to?*

Sorry?
When you returned to Saunders-Roe which department did you end up in?

In the stress office, surprise, surprise. Yes, exactly the same department in exactly the same place in the stables of Osborne House [laughs].

Had your duties changed at all?

No, it was almost as though I’d never been away, ‘cause I’d been back in the holidays all the time, you see, so I was … one of the office and expected back. The pay was as good as I was offered anywhere else, so – Jean was reluctant to come, she wanted to stay on the mainland, erm, but I already had the job so – but I tried to get jobs on the mainland but none of them bore the interest and so on that I was getting here, and the salary wasn’t any better so …

If you don’t mind me asking, what sort of salary were you on at this point?

God, I can’t remember, ask – ask Jean, she’ll know. I just – we were pretty advanced in those terms, erm, she did it all, I just handed it over to her. Because as a student I didn’t have much option really, so she did all the spending so she had all the money and it was a very amicable arrangement and we still – still today she does it all and, er, I quietly encourage her to do it, because her mother – and this I don’t want – can you switch it off?

[End of Track 5]
Track 6

Are you going to answer the question? Right.

What were you working on when you got back to Saunders-Roe?

Well, the – the chief designer had come up with a concept of a fighter aircraft with a turbine engine and a rocket, so that it would have the capability of a really high rate of climb to intercept a Russian bomber coming to do us damage. And, er, this was very advanced, it had a very thin wing so we couldn’t do what we were doing on things like the Princess, have a skin and what was called stringers supporting it at close pitch because they would touch one another, the aircraft – the wing was so thin. So it was – er, the wing was constructed of a lot of channels, U shaped, only the top and bottom of the U were very narrow to – and that was riveted to the skin top and bottom, so you – we called it a multispar wing. Now that had to be, er, analysed in a totally different way from an ordinary box which is what we – we were analysing before. Not only that, what was the level of stress that it could sustain, because that was different from before. So we had to do quite a lot of urgent structural work to find out the two things, and so that actually coincided with me coming back. Er, which I knew was going to happen, and Professor Argyris was a bit cross with me for, erm, going back and finishing my thesis down here at home, he didn’t like that one bit, which is fair enough. And, erm, anyway so I had to – and the wing was swept, it was a delta shape but it meant the structure was swept. Delta? Wing like that planned [demonstrates] form –

Could you explain?

Planned form of the wing was like that, not like that [demonstrates].

Could you explain the different for the tape?

Erm, well, a delta is a Greek D, so that you – the trailing edge was perpendicular to the fuselage and the leading edge of the wing was swept back about forty-five degrees, forming a delta, a triangle. And the thickness was two per cent, or two and a
half per cent, something of that order, which is very thin because it was to be mark
two, twice the speed of sound, fighter.

Two and a half per cent of what, sorry?

The thickness compared with the cord or the … cord? No. The length from the front
to rear was two or two and a half per cent of the length, so it was very thin. A normal
wing like the Princess would have been fifteen per cent, because unless – I don’t
know if you realise it, but a lot of people don’t, is that what keeps a wing up is the
suction on the top of it, not the pressure underneath it. Most people think it’s pushed
up by the pressure underneath but that’s not so, it’s mainly the suction over the top,
and that’s caused by the shape and the more curved it is the more – the more suction
you’ll get. So the – you get the suction in a supersonic thing by the higher speed and
that’s how you can get away with the – the lower thickness cord ratio.

[04:48]

Erm, so I was testing, with the help of Farnborough, and under Farnborough contract,
I was testing two aspects when I got back. Erm, one is the actual strength of the box
formed by these channels, lots of channels, and what load would it carry, and so we
were making specimens and breaking them to find that out, er, funded by
Farnborough, the Royal Aircraft Establishment at Farnborough. And then the other
thing we were doing was to find a way of analysing the fact that the box was swept,
erm, instead of being straight from the fuselage outwards, as most aircraft were at that
time, it was angled backwards, because it was supersonic.

[06:10]

And that kept me occupied for two or three years but in that time we were still
designing flying boats for this country and that country and NATO and what have
you. And we were even working on submarines, we were working on hydrofoils, we
– we were testing hydrofoils, er, to replace or partially replace flying boat hulls. And,
er, we built – we built what was called a ladder foil, which was several layers of
hydrofoils above one another in the shape of a ladder, one set each side of the craft
and one at the stern, and we built a – and we designed and built a – you noticed I’m using we? [Laughs] Er, and that was built for, erm, Canada and tested out there. And strangely enough I spoke to you about my interest in materials. High speed hydrofoils, er, the water will – when you get the suction over the top of the hydrofoil that can reach a point where the water actually boils and, erm, at a low temperature but nevertheless you get all these bubbles sprouting off the surface and that causes corrosion. And, er, so we were using model metal, which is a nickel material, and you were supposed – to avoid this corrosion you were supposed to have a low level of iron alloy in the model metal. And, er, we tested the – the material before the foils were built and it seemed to be all right but they – the testing level wasn’t maintained and they had three times as much iron in the actual metal that they were made of than they should have, and as a result they got quite a bit of corrosion in these hydrofoils after a while when they had been in Canada. But it did show that the whole system would work, was feasible, but nobody’s ever done it in anger you know, in a real machine, nobody’s – they’ve done the simple ones where the whole foil goes under the hull from side to side. The, erm, American system just had the one foil, didn’t have a ladder on, so we were doing all those things at the same time [laughs] and busy, busy we were.

What was the fighter aircraft?

It was called the SR53, it never actually got a name. We built, as far as I remember, three of them. Erm, yes, that’s right, we did, ‘cause one crashed from a high altitude and – for unknown reasons. One crashed on take-off, again for obscure reasons, at Boscombe Down, and the other one flew quite a few hours very successfully and, er, we were almost immediately – though as usual the government required a higher carrying potential for things like radar being advanced and all sorts of things like that, so it had to carry a higher weight and we built – and we were using a newer naming system, so that it was called the SR177, and it was just a slightly grown up version of the SR53. And we had formed a production line for this and everything, very roughly got through ninety per cent of the design and fifty per cent of the, erm, structure in the factory, and – now what was his name? Was it Sams?

Sandys?
Sandys? Er, Dick decided that the only defence we needed in this country could be provided by guided missiles, and so they cancelled all the fighter aircraft that were in vogue at the time, all of them, so it was an all plus and no minus decision, er, and wrong, absolutely wrong, but nevertheless he made it. And, er, we kept it going for a while on the basis that the Germans wanted it but when the Germans really absorbed the fact that we weren’t going to have it, erm, they cancelled and so it was cancelled in 1959 and half the workforce had to go.

[12:50]

Fortunately in 1959 we had built the SRN1 hovercraft, er, invented by Christopher Cockerell, which is another new chapter, but we continued to make aircraft components for other companies like Vickers and – and the Canadians and so on. And, er, we kept the aircraft business going, erm –

[13:20]

*What did you thing of the SR177?*

It was a superb fighter, oh yes, it was just a grown up SR53, and all the signals coming back from pilots were how good an aircraft it was. And it would have intercepted a mach three Russian bomber, so – though that requirement went out, er, it still could have been used for intercepting more conventional things or ground attack or … it was just a good fighter.

*What made it a good fighter, do you think?*

Just high performance, high manoeuvrability, ability to accelerate quickly, er, ascend quickly. Phenomenal rate of climb with its rocket engine, Spectre rocket engine, and all together it was just a really good fighter. It could carry bombs if you wanted and all those things that gradually evolved.

*You mentioned it was powered by jet engine and the rocket or –*
Yes.

*How did that actually work with having the two of them?*

Well, you could operate both at the same time if you wanted to but normally – well, in fact you did but, er, you would switch on the rocket motor for a quick take-off or – and/or a higher rate of climb, er, to get up to high altitude quickly, that was the purpose of the rocket engine, er, which there wasn’t enough high short thrust from the ordinary turbine engine to do that. Strange, I find it strange, that nobody has – has reinvented … re-established one of these fighter aircraft. I am surprised because it was a really high performance fighter aircraft. I suppose you could argue you no longer need such a high acceleration, you’ve got more time in most of the battles that we’re involved in, so – and at that time, erm, the Saunders-Roe chairman wanted to – to cash in on his investment in the company and it was put up for sale and split into two. And, er, all the aircraft bits went to Westland, they bought it, and all the other bits and pieces, er, went to Hawker-Siddeley group.

[17:00]

*You mentioned that you’d done some work with the RAE as well whilst the –*

Oh, yes, we’d done a lot of research work on structures and materials and things with the Royal Aircraft Establishment over the years. And, er, so we had a very good working relationship with them and that’s how, erm, we got the contracts for Black Knight, because it was the same rocket engine that we had on SR53, which was fuelled by high test peroxide, which is a nasty fluid that we were used to using and our Beaumaris subsidiary, er, was making the – the lorries, vehicles, to transport the stuff, so we were well into the knowledge of high test peroxide which would – was chosen by Farnborough as the fuel for this research into re-entry of, erm, guided – long range guided weapons, ballistic, so-called ballistic weapons. And, er, so we installed four of these in this thirty-odd feet long rocket, three foot diameter, and built them, tested the installation out at – near the Needles in an old fort out there. Er, flew
them out to Australia and tested – test them out there with all sorts of different heads, er, to check the re-entry of the – of the ballistic weapon, at very high speed of course.

_Could you very briefly just describe to me what Black Knight looked like?_

A bloody great long tube [laughs]. I’m not kidding, that’s what it was, it was just a great fuel tank, a great cylindrical fuel tank about, as I say, thirty-odd feet long and three feet in diameter, just a plain, straightforward tube. And then, er, fitted on the top was the shape and material that was being tested when it re-entered. Erm, we then rapidly discovered there were all sorts of other things about the re-entry, it wasn’t just the pressure and the temperature that was induced, it was what the head did to the atmosphere and the glow that it created as it re-entered and, er, various effects on the atmosphere that could be detected. So the Australian government and the United States government were very interested in this and a joint programme was instituted called Dazzle to investigate, not just – the programme had been instituted to get the right shape and material of the head, now it was a question of what could you detect of the re-entry. Er, and that programme then caused more Black Knights to be built, and all together we built twenty-two and tested, I think, twenty of them successfully, very successful programme, very cheap.

_What was your own involvement with Black Knight?_

Well, I did the original, with a colleague called John Underwood, who I had trained to be a stress man. One of the first things I had to do when I came back from college was find a way of educating new entries to the stress office ‘cause we needed them and couldn’t – couldn’t get enough of them, so I had to train them, amongst other things. And it wasn’t worried about, you know, time, ‘Ray will do it,’ and I’ve noticed throughout my life that the more you do the more you’re expected to do, and if you want somebody to do something quickly you – you employed somebody who was very busy [laughs]. It’s a fact of life, that is. Anyway, we did the first work with Farnborough on the feasibility of – in other words, how heavy would it be, how thick did the skin have to be, er, all those things were investigated in a feasibility study, and I was deeply involved in that and did all the preliminary structural work. And then it was handed over to the routine side of the office after that, until we much later came
to Black Arrow, which was a development of Black Knight which is another story all together.

[22:50]

_How did you actually work with the RAE? Did you visit them, did they visit you, was it all telephones?_

Mainly they visited us.

Who?

Well, Harold Robinson is the figure I remember most and I met him in later – later life, strangely over – what were they called? Erm, ground effect flying machines, they gave them a special name.

_Ekranoplan?_

Well, that was – that was one, yes. Well, that was a specific one, erm, there’s a – there’s a term for it, oh dear, wings in ground effect, WIGs, WIGs they called them, wings in ground effect, erm, which are sort of 200 miles an hour, er … hovercraft if you like, erm, which have all sorts of difficulties with them. But that – we’ll go into that much later if you like. Anyway he – when Farnborough began to be torn apart one of the jobs he inherited was to look into wings in ground effect, and he and I had quite long talks about that and the difficulties and good things about it.

_When was that? When about, it’s not the exact year, just a –_

… I guess it must have been the early ‘70s.

_Anth Robinson was your main contact with Farnborough or were there others as well?_

No, no, there were other people whose names have gone right out of my head, I was on very good terms with them. Erm, the one who was the head of the structures
section and he was deeply involved in the Comet investigation, of the fatigue of the Comet fuselage. I met him quite a few times and we had long discussions about that fatigue and, er … I think he said things that I have remembered vividly but I’m not prepared to talk about, about the … can we switch off?

[26.05 – pause in recording]

… to it then and, er, I can’t remember what I said now. Er, you asked me about the relationship with Farnborough and there was this senior structural analyst from Farnborough who was involved the Comet crash investigations, and we were very friendly and he used to say to me that the DeHavilland design team worked too close – too close to the line of safety and they were – they were too often going above that line. And, er, I told him that in the case of the Comet I didn’t agree with that, because they had – although they had gone to a much thinner skin on the – relatively speaking, on the Comet than we had on the Princess to the same internal pressure, erm, the same – we had gone to a considerably lower stress level than they had for fatigue reasons. But nevertheless they had seen the problem and they had tested for it. What they didn’t allow for is one particular area where the stress level concentration had gone up too high because of modifications that weren’t in the original test. And so I said it was bad luck really, although maybe they did go thinner than they should have done, nevertheless they took all the design precautions that they should have done. So I didn’t hold his view but that was a view not only expressed by him, but I personally don’t hold with it.

[28:14]

*It’s all right, I’ve got the time down for that so I’ll just stick a neat restriction on it.*

Yes.

*It’s interesting though, it brings me onto another question. I’m just thinking about fatigue and stress in aircraft, is that something you worry about?*

Absolutely, oh yes, that is an absolute design criteria, very firmly so.
What was the worst case scenario at the back of your head, if there is one, I don’t know, is there?

Well, the big problem I always felt is the join of the wing structure to the fuselage structure but one thing that I learnt the hard way was when I came back to the company from college I was asked to go and sit by the side of Queen’s Counsel, er, over a court case of – not a court case, a court enquiry, into a crash of a Viscount aircraft at Manchester where the – the structure supporting the flaps and ailerons had failed and allowed the structure to go upwards all along the trailing edge and – which had done two things. First of all, it had reduced the lift and secondly, running through it was a wire that was used to lock the ailerons and the flaps when the aircraft was parked, and that was pulled up by this failure of the route of the trailing edge behind the main structure. And I had to sit through this enquiry listening to the material problems and the stress levels and the repairs, and there’s a whole chapter of things that had gone wrong and I began to think, you know, have I gone into the right industry with this chapter of – now this is all public record so I can freely talk about this. Erm, what had happened, they had a chain that ran over little pulleys that rotated the flap and the aileron up and down. And they kept – this chain kept failing so they put a stronger chain on, and as a result they arbitrarily in a design sense decided to up the strength of where these outriggers that held the flaps were attached to the main structure. And this was a fitting that – that was embedded against the spar at the base of the wing structure and they didn’t want to take the rivets out that riveted the main structure together, so this fitting had to sit on top of it. And they didn’t properly, erm – it’s called blueing, you put some blue onto the – onto the top of the rivets and put the fitting on top of that and just move it about a little, and that will show you where the head of the head of the rivet was on the fitting that you’re going to put on. And they didn’t do that properly so it didn’t hard onto the wing spar, that was the first thing. The second thing was they, er, found a much stronger 100 ton steel to make the bolt that went through this fitting on the spar to hold it together. And because of the, erm, fact that they hadn’t properly checked the bedding down of the fitting the, er, bolt didn’t square sit onto its base, so you had an eccentric load on – on the bolt. And this high strength material, erm, when the – the thread was formed by grinding, er, cracked at the roots of the threads and they found on examination of these bolts in
store that they were already cracked. And so surprise, surprise this bolt failed, allowed the – the whole bracket to go upwards, pull on this wire and lock the ailerons, so – and it happened when the aircraft was being banked and so it stayed in the bank and down into the ground. And I sat through all this and there you are, you’ve got a combination of design, erm, material, everything that can go wrong, and then they presented the calculations, the stress office calculations were presented to the court, and there were these little notes in the margins about these – these modifications. Little notes in the margin, not – not a proper report. And my goodness, did I learn something from sitting for, I think it was for about three months. Still doing all this other work, you know, and none of that stopped [laughs]. Good old Ray, he’ll go and – he’ll go and sort the Queen’s Counsel out, oh dear me. Anyway, er, so my goodness did I learn something from that.

What did you learn?

Well, how bloody careful you’ve got to be in life to do things properly. My goodness, yes.

[35:34].

Can I just –? When we were talking about Queen’s Counsel and did you sit on any other –?

Yeah, I’d finished that.

Did you sit on any other similar –

No.

Investigatory boards?

Well, we made the wings at Eastleigh, you see, that’s how we were involved.

[35:55]
I was wondering if you could give me some idea of – obviously building an aeroplane is a teamwork enterprise, it’s –

Yes.

Where does the stressing office actually fit into this process? Let’s take maybe the SR53 or the SR177 as an example –

Yes.

But where does the stress office fit compared to things like the aerodynamics office, drawing office, works?

Well, all the drawings, and I mean all the drawings for the aeroplane, go through the stress office and have to be signed by the stress office, and that includes any modification whatever has to be initialled by the stress office. That’s how it fits in; it’s the route by which the drawings get to the works.

So where were the drawings coming from, which –?

The drawing office, which is the main – that’s the biggest office is where everything’s drawn and then those drawings are all passed through the stress office down to the works.

So everything has to go through them?

Everything, even if it’s obviously not structural it still goes through the stress office and is initialled to – passed through the stress office. In other words, the stress office even signs that it hasn’t stressed it ‘cause it doesn’t need it, it still has to be still initialled.

If something changes in the design does it all have to be re-stressed again or –?
Depends, the stress office decides. It goes through – on the drawing there’s a column in the right – usually on the right hand side of the drawing where it says what has been modified, when and by whom, and then there’s a little column down the side of this column where it’s initialled by the draftsman who did it and the stress man who – who looked at it. And it’s all given a mod letter and, er, properly recorded.

[38:20]

Right, that’s helpful. I think we started off a little while ago how you actually became involved with Black Knight in the first place –

Oh, yes, yes.

Weight analysis you said or …?

Yes, that’s right, because it’s a bit marginal I always think. The – a typical rocket is fired off vertically, or these rockets certainly were, but whether it is or it isn’t, it doesn’t make any difference. If you think of it as going vertically, erm, you – the thrust from the rockets is about one third bigger than the weight, not two times the weight or three times the weight, one third bigger.

It doesn’t sound very much.

No, so you can imagine how important the weight is ‘cause the rockets have got a fixed thrust and so you – you’re trying to get the biggest rocket, biggest structure of a rocket, that you can for the power that’s available, and that’s about the margin. And in fact sometimes less than that. I think Black Arrow was 50,000 pounds thrust and 40,000 weight, which is a quarter of the excess, so weight is very, very important.

Is it different doing the sort of calculations on a rocket rather than an aeroplane?

No, no, it’s just the margins are marginally smaller, if you can understand the double negative.
Or to go wrong more easily.

Oh, yes. The other thing about the rockets is the vibration is very severe and every component in the rocket has to be vibrated, erm, to the levels that are expected in the rocket. And that’s vital, we did a lot of that, we did that in company and we designed all the controls, electronic controls and everything, it was all designed in company for the rockets and tested.

You mentioned that you tested the rockets themselves, how?

Well, they were held down out at the rocket site out at, er, the Needles by a claw fitting at the bottom. And then the rockets were fired up to full power and they were – they were rotated on their mountings. So you had the four rockets and they could do that, and then these two could do that.

So could you explain what that movement is as well for the –?

Well, that’s the thrust going down there and so two opposite – there’s four engines. Er, take two opposite ones, they could go together or separately, so – and if – if they went together they would go side – it would push the rocket sideways. If they went opposite to one another they’d rotate the rocket. And then you’ve got the same with the other two, at ninety degrees, so you can see that that can drive the rocket in any direction, that combination. So what was then a – we had a company designed computer control system that would pulse through the rocket all sorts of controlled manoeuvres whilst it was tied down. And that is a much harder vibration than when it was free, as you can imagine, so it was a severe test. So the rockets were fired at full power, gone – and the whole control system was gone through the testing the instrumentation, everything, from a controlled … centre distanced from the rocket under – underground, part of the old fort out there, and they’ve re-established it now, you can actually go there and go down into the place where all the instrumentation was, and then all this was gone through and if – if something went wrong a modification had to be introduced and it tested again. But there were very few of those, very few indeed.
*Did you see any of the tests yourself?*

No, far too busy to go out there, and you couldn’t see anything anyway, you were underground. All you’d see is some guy marching up and down making sure every – everything was working, so there wasn’t really any point in going out there [laughs]. All you could feel was a bit of a rumble [both laugh]. I used to have to go out there and, er, have a Christmas dinner with the blokes and wish them well and all that sort of thing, and thank you very much and all that sort of thing, I used to have to do that, on Black Arrow, not on Black Knight.

*Did you have any moral qualms about working on a rocket?*

No, no I didn’t. In fact I’ve never even thought of that until you’ve just said it. Erm, why should I – it was research that was vital for anything we were doing in space. Why should I have morals about it? I had – I had morals about, er, intercontinental ballistic weapons, yes, but that had nothing to do with this really. Okay, it was applied to it but it was very important research. I mean even the satellites that we launch have to, erm, get involved in that sort of research, and so that never occurred to me to – and don’t forget, we were involved in fighter aircraft and that’s shooting down another fighter aircraft or a bomber or what you, what’s the difference?

*Can I adjust your mic one second? Did you have anything do with any of the other tests on Black Knight anywhere else, in Australia or anything, or –?*

No, not on Black Knight, no, but I did on its subsequent development, Black Arrow.

[46:30]

*How much were you told about what it was being used for?*

Only just that it was re-entry. We had, erm, nothing more to do with it than it was testing the materials and shapes of the re-entry head. So which was the best, which was the lightest, erm, which – which was the most stable, that was probably the most important bit.
And the period we’ve sort of talked about so far as being sort of over the course of the 1950s, did your own job change at all in that period?

In the 1950s? Er, not really, no, no, it was not until the mid-’60s that my job started to change. The – when the company was taken over the first big job was, erm, the – we were invited by, erm, Shorts who were designing an aeroplane called the Belfast which was a big, erm, troop and tank and what have you carrier for the army. And we were to design the rear fuselage and tail unit, and the big heavy ramp up which the tanks got onto the aircraft, and we were to build that ramp but design the rest. And, erm, the tail unit was to be a copy of the tail unit of the Bristol Britannia, so we had to work with Bristol as well as Shorts. And I was in charge of the structural strength of the whole thing and was made assistant chief stress man as a result. Er, so I had to travel to Northern Ireland a lot and, erm, one of the people I met most was the chief stress man at Belfast called Wolf Kay. And, er, we got on very well indeed, became firm friends. I’ve lost track of him of course as I’ve met so many people in my career but he’s a nice guy, actually I imagine – quite a bit older than me, so I’d imagine he’s no longer with us, but he was one of the good guys, he was, and it made a pleasure of travelling to Northern Ireland. I can remember vividly the – the head draftsman, the senior draftsman, who was responsible for the drawing was a Welshman and Wolf of course was a Northern Irishman and there was me, an Englishman. Er, Wolf invited us to a football match when, erm, Wales were playing Northern Ireland, and of course I had a whale of time teasing them both [laughs] when the ball was going one way or the other way. I sat in the middle of them as well and I teased the life out of them. So when – I told you that as this period I never drank alcohol, couldn’t afford it, so he takes us to a pub and, er, after the match he said, ‘Now then, Ray Wheeler, you are going to have a pint of Irish Guinness now, and you are going to drink it,’ [laughs] and so he gets me a pint of Guinness and I thought it was a diabolical – I thought it was the worst kind of medicine you could have, so I downed it as fast as I could and before I could turn round there was another one [laughs]. Oh dear, oh dear, so he got his own back.
Actually in 1959, Northern Ireland, that was before the troubles isn’t it, it’s –

Oh no, oh no, no, it wasn’t. I, erm – I can well remember the way I first went to Northern Ireland was you travelled by train up Liverpool and got on a boat to Belfast. And the boats were exceedingly comfortable and you had a superb breakfast, and I went down to breakfast on this first morning and I looked – it was the twenty-first of July is it? It was somewhere in July and I looked out of the window and there was this great big, erm, unloaded tanker looking vehicle – ship moored across the harbour from – from the boat. And written in huge white letters across the hull was ‘Kill the fucking pigs’. No kidding. Letters as high as this room, right across, along the length of the hull. And I called the waiter over and I said, ‘What’s that all about, who’s done that?’ And he said, ‘Don’t you know Northern Ireland?’ I said, ‘No, I don’t.’ I know my father was here in the ‘20s and had his teeth knocked out in a fight with Irishmen ‘cause he was in the army. That’s all I know.’ And he said, ‘Oh, no’ he said, ‘that’s the troubles you’re looking at out there’ and that was 1959. No, it wasn’t, it must have been more 1961, roughly 1960, so the troubles were there all right.

Was it something that affected – you were working with Shorts in Belfast –

Oh, yes.

Was there any of it there?

No, I never saw any trouble. Never saw any trouble travelling about the city, no, but that was all, was all I saw.

[53:35]

From working in, you know, one aircraft company on the Isle of Wight to going and having a look around another one and working with them, what sort of differences did you notice between the two?

Nothing, almost identical organisation. I was impressed by one thing though. Erm, I was in the design building and, erm – and this was a bit later, towards the end of my
stay, they’d got a new managing director who had been at Messier, the hydraulics
design company, and he had come to Imperial College two or three times to give us a
lecture on hydraulic design and that’s all. I never actually – I always – when I was at
school I always got into the back row, when I was at college I always got in the front
row, and this was what, fifteen, postgraduate students I guess. And he came two or
three times and so that this was – and this was, erm, over ten years’ later in a dark
corridor down below and I hadn’t spoken to him when he lectured in London, he
recognised me and stopped me. And I was very impressed by that, very impressed,
ot only that he recognised me but he stopped me and spoke to me from managing
director to a comparatively junior stress man, and that really did impress me. Very
big, tall, silver haired gentleman, I wish I could remember his name but I can’t. But,
no, the organisations are exactly the same as our own, absolutely identical. And that –
but I also to travel to Bristol and, er, they appointed a liaison officer. Now, I can
remember his name ‘cause we got very friendly, Lance Mossom was his name, er, and
I stayed with him quite often and he had the family stay with him as well. Er, very
nice guy, I mean by that time we had three kids trailing along behind us. Erm, so that
was a – and that was a very successful aeroplane.

Can you –?

You never heard of it, on that sort of successful aeroplane. That means it hasn’t
crashed and it hasn’t done anything that draws its attention to the public.

Can you describe it to me?

Describe it? It was just an ordinary big aeroplane able to carry, as I said, quite a
number of troops and … very similar to the Bristol Britannia which was just an
ordinary tube with a tail unit and wings sticking out of it [both laugh]. It had, erm, I
can’t remember what the engines were, but they were gas turbine engines, not piston
engines, piston engines, just ordinary aeroplane, but big. I can show you a picture of
it.

No, I’m just –
It’s in – in my book.

_I’ve seen it [laughs]._

So you have seen it.

_I always have to think about the people listening to the tape and so [laughs] –_

Of course you do, and quite right too, but it’s just an ordinary aeroplane. The most inventive thing was the – the hooks that anchored the ramp with – onto the rest of the fuselage and they – they rotated into position like that [demonstrates?]. And, er, they were – that was a very good design by one of our draftsmen.

_Hmm-hmm. There were –_

But that was the only thing special really apart from the fact that it was big. But we were used to the Princess, you see, so – and that was – wasn’t as big as the Princess, so it was just an ordinary aeroplane to us.

_And the sort of work you were doing was the same sort of structural –_

Yes.

_Stressing?_

Yes, ‘cause the build was a typical aeroplane of the time, very like the Princess.

_I’ve got a little collection of questions that come up around the same sort of period I’d like to just quickly run through._

Go on then.

_One of them was talking about computers actually, I was wondering when they came into what you were doing._
When they came into what we were doing? Well, we were making analogue computers in production at the company and, er, we were using them to, for instance – we had a flight simulator for the SR53, our own design, we had a little cockpit that you could sit in and fly the aeroplane with these analogue computers, so that had a big influence on that. And also if you had complex equations, erm, the computer department with these computers, which were also sold and used at all sorts of places, like the Black Arrow testings, same computers, erm, we could solve equations, complex equations, with this computer but it was analogue, it was not digital.

*Is this something you actually used yourself or were there –?*

No, we had a department. It was a great big thing and it would fill this room, and you didn’t have your own, you gave the equation to the head of the computer department and he solved it – he solved it for you.

*What would you get at the end?*

Well, the – whatever it was you were – they set the equation up for, the stress levels or load levels in – in the structure or in some cases the effect of temperature on the distortion of structures and whatever, just general analysis and solving of difficult equations. You could do it so much quicker than – than just punching numbers, columns of numbers, and do one column and then another column and then another column, took hours, which is what we did before we had these analogue computers. But we only did that for difficult, very complex equations.

[1:01:13]

*I had a bunch of other questions about sort of 1959 really, you know, I mean the sort of things that happened in that quite sort of short period of time -*

Yes, it did.

*A year either side.*
They did, yes.

I was wondering firstly how you felt about the SR177 cancellation.

Appalled, it was a stupid decision, we were all – we all realised it was a stupid decision, that there’s no way a missile could do what a fighter could do, absolutely no way, it’s ridiculous. And the best thing was the combination, the fighter carrying – carrying the guided weapon and, er, to talk about 100 per cent shooting down of an aeroplane with a ground launched big rocket, we thought was just daft, although the Russians did do it later of course, they – they shot down the spy plane but that was later. And also the other thing was launching from ships, for instance, you could – the SR177 could be – was going to be aboard an aircraft carrier, so you could go and, er, use it way away from the base. So what are you going to do with a guided weapon? I mean it’s – you’re either launching it to hit or you’re not, it’s one or the other, you can’t go and have a look and see whether you should be doing it or not, should not be doing it. You can do that with the aircraft, you can go and have a good luck or even if it’s an aeroplane, make sure it’s not a bloody passenger aircraft you’re firing at. And that happened didn’t it? That happened over the – who did it? Erm, I don’t – it was an aircraft shot down in mistake, wasn’t there?

There’s rumoured to be one a few years ago but –

Yeah, but I’m talking about the ‘80s or even early ‘90s, there was a passenger aircraft shot down by mistake, wasn’t there, thinking it was a military aircraft. Anyway, that’s the sort of thing I’m talking about. To us it didn’t make sense at all, it was just silly, stupid, and if Duncan Sandys was sitting in front of me now I’d tell him just that. And that’s what’s emerged, here we are now, we only make fighter aircraft, they’ve got to do the bombing as well [both laugh].

How did you actually learn about the cancellation?

Oh, we were just – I suppose a note was put out to all staff that it’s cancelled and X number of people would regretfully lose their jobs. The gloom – the gloom over the
company was horrendous, awful and, you know, we had a house in the – what was
called the company estate, which is over the side of York Avenue, erm, and funny
enough having lived in the estate I’m now on the committee that owns – the housing
association that owns the estate [laughs]. But, er, there was a lot of the designers
there and it was a very pleasant community that we lived in before we moved in here.
And, er, the gloom was appalling, absolutely – absolutely appalling. Things like the
hockey team, half the hockey team disappeared and we only had one eleven. We
managed to survive but it was – it really was – I don’t even like thinking about it, it
was so appalling. ‘Cause we’d worked so hard. I mean, you know, we were working
something like a forty-eight hour week and we’d be working ten hours’ overtime as
well. Now you ask somebody to do that many hours these days. Do you think they
would? We thought nothing of it.

*What happened to them afterwards, the people who left?*

Well, they went all over the place. Some went to America and some went to Canada,
er, that was the main place they went to, ‘cause they were offered good jobs there, you
see. Erm, and we – we’d been working on some upmarket stuff and, er, some went to
Marconi’s at Portsmouth, some went to, erm … companies in Southampton. I’ve
forgot – can’t rescue the name but, er – and people went up north, not many. That’s
about 1500 people I think that went.

[1:07:25]

*Ever think about going yourself?*

Well, the thing is that we had seen it coming and the company was forming all sorts
of subsidiaries. And one thing we were doing before, that we had been working on
for some time, a year or two before the – on hovercraft, for instance, we saw that
coming. Erm, we formed a company to make aluminium structures and we made
things from huge domed roofs an enormous 350 foot, erm, structure for a radio mast
in Africa that had to be assembled on site and then pulled up. Erm, and we’d been on
that about a year, we – we’d formed – because we’d – one of the things which we
haven’t mentioned was that one of the proposals for the Princess, not very long before
this cancellation, was to install in the – in the existing Princess that had flown, take
one of the engines out and put a nuclear powered engine in that the American
government was investigating. And the point of that was you could test it and you
didn’t have to fly it overland and you didn’t have to take what was essentially a
nuclear weapon, er, overland. So they chose the Princess flying boat, it was big
enough to carry it, and we all had to learn nuclear engineering, all the senior people.
After five o’clock we had to go for an hour and listen to a lecture on nuclear
engineering, so one of the subsidiary companies that was formed was a nuclear
engineering company, erm, and an area was set aside at Osborne for very small units
to be used for various things. That event – went to Hay’s much later, but that was so
we had this ring fenced place at Osborne for nuclear engineering. And, er, so we were
well equipped with things to be able to do and, er, I was put in the position of being a
sort of engineering advisor to all these companies because of my background on so
many things. And, er, gradually, or quite swiftly – and then this work came from
Belfast, so no I didn’t – didn’t consider leaving, we were very happily here and the
aircraft – aircraft industry was dying anyway, so there wasn’t anywhere to go. Even
Farnborough was being dismantled, so there wasn’t the opportunity really. And I
didn’t want to go to America, I’m a Brit [coughs] excuse me. I’m proud to be, I love
England and I didn’t want to go. I was tempted to go to Canada ‘cause my brother
was there but, erm, there was no real aircraft industry in – in Canada at the time.
Later they made a – they created a company making Proptjet aircraft that still exists,
called Bombardier now and you do fly these aircraft. Easyjet have got quite a lot of
these aircraft and we make them ourselves for those. So, no, I didn’t.

[1:12:00]

Did you ever think that the work you were doing was of national importance?

Yes, yes I did, all the work that I’ve done I thought was of national importance, yes.
And it was, I would argue with anybody about that [laughs].

Could you give me some flavour now about how you thought it was of national
importance, in what respect?
Well, I don’t know that I thought that. You asked me the question did it ever occur to me and I said yes. I wouldn’t say it was any big thing, I didn’t think about it that much, erm, it just was and was put to us as such. I mean the aircraft – the hovercraft industry, for instance, the start of that was a great British adventure wasn’t it, and everybody thought that, and it was, it was.

*I’d like to get onto the hovercraft stuff in more detail but I think that might be good for a session on its own in a minute.*

Yeah, okay.

*But I have one other question actually about 1959, and you were talking about the split of Saunders-Roe into bits that were owned by Westland and, bits that were owned by Hawker-Siddeley.*

Yes.

*How did that work?*

Well, mainly the aircraft orientated bits went to Westland, er, and that included the structures division, that went to – and joined – they had a – they had also been diversifying and were making garage doors. I don’t know if you remember the Westland garage doors that went up and over, so that went to Westland. We had the plywood factory and, er, plastic factory down in Folly, on the River Levine, which had been created by Sam Saunders, that went to Hawker-Siddeley. Erm, the helicopter division at Southampton, that went to Westland. The, er – the Beaumaris division which made boats, yachts, erm, buses, transporters and had modified aircraft during the war, Second World War, that all went to Hawker-Siddeley. And that’s about it, I can’t think of anything else at the moment.

*Which bit did you end up in?*

Oh, the aircraft bit that went to Westland.
I got the impression you were quite fond of Saunders-Roe as it had existed. What was your own personal take on this split-up into different places?

Well, you just lived with it really, you didn’t have much choice in the matter. It’s not as though you can do anything. Erm, we appeared to be – no, I’m sorry, I shouldn’t have said that, sorry I’m doing it again. Has it been all right?

Yes, it’s been – mic position’s fine.

The, erm – we appeared to be welcomed by Westland. I’m only saying appeared ‘cause I couldn’t think of another word but, no, we were welcomed by – as part of Westland. And, I should probably criticise the Westland board later on for various things but any board can be held as doing daft things from time to time. Erm, they did really support the work we were doing on hovercraft, the Westland board did, so – and that was really starting at that time, the time of the takeover. So, er, from that point of view it seemed a good thing. But I’m desperately trying to remember, I don’t think he made it. It was a – I don’t know what you know about Shorts Belfast, er, and what was said. I can’t personally vouch for it but I’ve never heard it contradicted, that during the war Shorts, which was at Rochester in Kent – Kent, yes, charged for a Stirling bomber that they never built, so it is said. And as I say I’ve never heard it contradicted and therefore they – they were moved to Belfast, to get employment in Belfast. And the then chief designer, Henry – no, not Henry, no, Arthur Gouge, er, used his funds to become chairman of the Westland board they, Saunders-Roe, bought just before the end of the war. And he was the one who wanted to sell the company to get – get his money back in the seven year rule that you can pass some of it, or all of it or whatever, on to your descendants without inheritance tax provided that it’s done seven years before you die. And I – it was very marginal, I’m not sure whether it was – which side it was, that he achieved his aim but that was why the company was sold, we were told. I emphasise, we were told.

Shall we take a little break?

[End of Track 6]
You mentioned that the other thing that happened in 1959 was the start of the Hovercraft work at Saunders-Roe. How did that come about?

No, it started earlier than 1959, erm, more like 1957 we first heard of it. Erm, Christopher Cockerell, er, who had been an electronics designer at Marconi, had left and created a boatyard in – in Norfolk and decided he would know how to make boats go faster by air lubricating their bottoms, their hull bottoms [laughs]. And, erm, he patented his ideas and approached the National Research and Development Corporation and they, er, sought people to interest. They first went to Shorts, who weren’t interested, and then they came to Saunders-Roe who said that they were interested provided any work they did was under contract. And so we got some contracts, we did a lot of wind tunnel and, er, theoretical work until about the middle of 1958, and then we put a proposal to make a manned hovercraft to test the principle. And that – we got a contract to build it in … ‘58 I suppose, and went ahead like a shot out of a gun and it was only a few months later we had built the thing, and it was a – christened a flying saucer ‘cause it looked like one. There were all sorts of problems but we, er, got it designed and built. And, erm, in 1959 we had completed some tests and called a press day and the press came along and we were intending only to show – show the craft lifting up and sort of turning round in circles and that sort of thing, and the press demanded we take it to sea, so we did. And my part in it had been I was in charge of two things as usual, I never seemed to get one job and nothing else. I was in charge of the structural strength of the craft and I also was in charge of the generality of design requirements for a hovercraft because the ship designs criteria weren’t entirely applicable, some things were, some things weren’t, and it – the same thing with the aircraft design requirements. So somebody had to sort out what the design requirements were, and that was me, so I – I did the job and one of the things that became immediately obvious was that the main strength requirement was going to be when the craft was going along at its top speed and the engines cut, the engine cut, and the craft ploughed into either a wave or the sea. And that was, and still is, the major design requirement for the strength of a hovercraft. Er, the overall strength of it is a beam and the local strength of pressures on the hull, so
that was my part of the job. But anyway, I was asked is it okay to go and see in a way which said you’ve got to say yes, which I did and [laughs] off it went.

[04:49]

And, er, there began the tale of hovercraft. And a few months later somebody, I think it was Christopher Cockerell but I’m not 100 per cent sure, certainly he claims it, remembered that it was the fiftieth anniversary of Bleriot crossing the channel, so the craft was suddenly shipped off to be taken across the Channel. And there’s umpteen little stories associated with that which could – we could fill the next hour with if we wanted, at least. But anyway, it successful managed to get across with about a pint of petrol left and, erm, so it all began.

**Why was it so problematic to get across the Channel?**

Only just the, erm – there was a measure of head wind and I can’t remember exactly why we – oh, no, of course, we had to go from – from France because that’s what Bleriot did. So, er, we had a bit of a head wind, er, the weather was a bit rough but it was decreasing and they went off early in the morning. And don’t forget the craft’s top speed was thirty-five knots, and that was its top speed, you couldn’t do that all the way, and limited fuel on board, but thought – two extra tanks were put aboard to make sure that, er, we would get across but with this – with this head wind we couldn’t make anything like thirty-five knots and, er, it just made it across. Erm, and the press and the world at large descended on the hovercraft idea and what are we going to do next was the immediate question.

**Were you on board yourself on this trip or –?**

I wasn’t on it, no. You could only get three people aboard, two in the cabin and one outside. Erm, Christopher most – some of the time was in the cabin but most of the time, er, we found that you needed ballast to get the bow down, to get the best performance. And, er, so he was the ballast and he wasn’t tied down which was a, you know, health and safety totally were ignored [laughs], and John Chaplin, a friend of mine, we played hockey together, and he was the sort of trials man. There was
supposed to be another flight engineer but Peter Lamb had control of the machine, had
decided to go early and they couldn’t get the hotel to get Bob Strath up too early, very
early in the morning, like four o’clock or something. And, erm, so they went with
Christopher and, er – and John Chaplin and Peter Lamb, that was the three crew.
And, er, it successfully crossed the Channel and the whole world woke up – seemed to
wake up to this combination of the trial of the quick crossing of the Channel, and what
are you going to do next was the question. And, er, so fortunately work had been
done on that and we were able to make proposals as to what we were going to do next.

[09:05]

*You mentioned that the first one was called the flying saucer, why?*

Well, ‘cause it looked like one, it looked like a saucer. Er, it was almost round, it was
supposed to be slightly elliptical, but we found it was much cheaper to make two
round bits, a bow and a stern that was round, and then two straight bits joining them
together. And, er, it did, and it was – the struc – it was a platform and duct that was
something like two feet deep all together and round, almost round, so it did look – and
then there was a cabin plonked on top of that and an engine intake with the engine in
it, in a cylinder on the middle, and so all you saw really was large saucer with a cabin
on it and an air intake, so it did look like a saucer. And because it wasn’t on the sea or
on the ground it was flying, so flying saucer.

*I’m going to have to ask one of those –*

When – when the craft was doing exercises in France one of the fishermen tried to lie
down in front of the craft and get it to go over him but it only had about a ten inch
hover height, so that didn’t work [laughs]. He had to be ushered off the premises so
to speak [laughs].

*Would you mind explaining in simple terms how the SRN1 actually worked?*

Well, essentially you have a fan which was really like a propeller that sucks the air in
driven by a piston engine and that air is then distributed through duct for two things.
First of all, an inward pointing jet that forces the air under the craft and lifts it about ten inches, foot if you like, all the way round, and the other third of the air is ducted to – into ducts which will propel it either forwards or backwards. And in those ducts were controls that would, erm, turn the aircraft and fins were mounted at the back to stabilise it, and that’s about it really. Erm, there were two jets forcing the air under the craft because they – that was needed for stability, otherwise it had a fairly high, like three or four degrees, of incidents on the machine, it was unstable, it would rock, so we had the two jets. The second jet was added during the course of build ‘cause we found this instability in the wind tunnel.

*Did you think about it as a plane or a boat?*

No, we thought about it as a hovercraft. No, we didn’t fall for that one. It was built of aircraft materials and, er, the weight’s important because it’s air that lifts it, and the heavier it is the more aid you need to lift it, so weight is important. And that turned us to use aircraft materials, but otherwise we still – we were – don’t forget we live in the sea really on the island and we’re all marine people here anyway, basically we are, so we did think of it as a boat as well. We didn’t fall into that trap of thinking of it as an aeroplane. One or two people at the firm did but they were usually mainlanders [laughs] – overners.

*What did you think of the press reaction to the hovercraft when it first came out?*

Oh, we were chuffed of course. I mean we’d designed this beast and we were very glad that it worked, not that we had – that’s a strange thing about design teams, you don’t expect what you’re designing not to work, that doesn’t occur to you, it’s going to work and we’re going to make it work, and that’s the – you don’t even think about failure. You think about failure in the sense of if some precaution’s needed for something going wrong, you do that, but you’re not expecting it not to work. You’re expecting it to work, that’s what you designed it for.

*Did you encounter many problems with the first one?*
Erm, one problem that I was very cross about, the – this propeller was in a duct and, erm, the – they wanted an absolute minimum of clearance between the tip of the propeller, fan, whatever you want to call it, and the structure to make it as efficient as possible. And the, erm, aerodynamics department asked for that gap to be kept small, so the chief structural engineer designed struts off the engine to support this duct within the structure of the main duct down which the air was going to come. And, er, I revolted over this because I said that all those vibrations would make it pretty well impossible to design a duct on the end of these struts that wouldn’t vibrate enough for this small tiny gap of a few thousandths of an inch to hit the top of the propeller, and I said it wasn’t going to work, and they insisted that strain gauges be installed on this duct to measure what it was doing, erm, when we ran the engine up. And, er, I told the chief structural engineer he – since he was insisting on doing this he’d better sit in the pilot seat and he should be the one who ran the engine up the first time [laughs]. I was on good terms with him so I could get away with saying things like that, and we were all laughing about it at the time but it was very serious. And lo and behold, they ran the engine up the first time and – and several of the strain gauge results went off the scale, so I rushed down there, and John Chaplin recalls this, of me rushing down there, ‘Stop that, stop that running.’ And I had it – I had it taken off straight away and, er, it didn’t make any difference [laughs] which I was absolutely convinced it wouldn’t. And – but you see, that would have been – the chap sitting in the pilot seat, his head was in line with the propeller, so if that had fallen to bits it would have been dreadful. Anyway, that was the big problem, otherwise no, we didn’t have anything of any consequence.

[17:40]

But they were – the sort of swivel sort of butterflies in the valves, in the ducts, to control the direction of the craft and things like that, they vibrated and we had to change that from, erm, butterfly dials into ducts, swivelling ducts, because it was totally unstable, it would just – they were hopeless. Er, and that – that’s about all what I can remember. All that – we would do things overnight you know, with – it wasn’t something you said, oh well, it’ll be couple of months to do that, you did it for tomorrow. I’m not kidding, I’m not bullshitting you.
Why the urgency?

Pardon?

Why the urgency?

Well, it’s just the problem had to be solved and that’s it and you did it. But you weren’t 100 per cent certain that what you were doing was going to cure it though, were you? So you had to think of if that went wrong, what next, so the quicker you knew the answer the quicker you knew whether you had to do something else or not.

[19:00]

What’s a strain gauge? Just a quick clarification question.

Oh, it’s a little – mainly of wires but not all of wires, in a – wound up and down so that you stick in a sort of paper envelope and you stick that envelope down onto the structure so that when it moves the little wires are stretched or compressed. It’s a little thing, most of them were about an inch and a half long, and a quarter to three eighths of an inch wide strips, and then you soldered the wires onto them. But we had in the company our own design of strain gauges where we made the – a grid by etching away a thin, very thin sheet, so that it was again like several lengths of wire but that was much easier to deal with and we called them foil strain gauges. And eventually a company that still exists, erm, makes those gauges but the common ones are the wire – are wire, and you’re just measuring the strain and so then you have to factor that up to stress.

[20:40]

Right. You mentioned that you were working overnight now and again on solving problems. What’s a typical day’s work? What’s a typical day in general like for you in about 1959, 1960?
Oh, well, mostly we would work ordinary forty-eight hours or whatever it was we were working at the time. Er, we’d given up Saturday morning work some time before but not – not all that long, and if work demanded that you put in another couple of hours you put in another couple of hours. Without thinking, you just did it.

**What time did you typically start?**

In those days I think we started [calls wife]. What time did we start work when we were first married?

Jean Wheeler: I think about – hang on, I’m just coming in.

**Do you want me to pause that?**

Is this all right?

*I think I’ll pause it. [Pause] So what time did you typically start work?*

We started work at around eight-thirty at that time. Er, somewhat later we worked at nine o’clock and then later again, er, it went back to eight o’clock so that we could stop earlier, which as far as I was concerned just meant – at the time it went back again to, er, eight o’clock just meant I worked longer hours because, er, the telephone didn’t know we were working that way and I – I guess the main hours per week went down to something like thirty-five hours, maybe not quite as low as that, before I left, but that made absolutely no difference whatsoever to me [laughs]. And going in an hour early was just another – another hour to work. So I didn’t approve of it very much, but they were are, that’s what we got negotiated.

**What sort of things –? Can you actually talk me through what a day’s work is like in about 1960 or so? So you wake up in the morning, what do you do next?**

What do I do? What period are you talking about?

*About 1960 maybe.*
1960? Erm, 1960 – at that time I was going to work on Jean’s bicycle because mine had been stolen in London and, er, it was a nice bicycle and she always says I wrecked it, which of course I probably did. Erm, but – and then – so that was around eight-thirty and you’d just go to your desk and get on with your job at that sort of time. Er, and then lunch we – most of us went home. You could get a sandwich in a little canteen in the design office, er, a cup of tea. Incidentally in that – at that time we – in mid-morning and mid-afternoon, erm, cheese rolls and that sort of thing were brought round and tea or coffee, and a cake in the afternoon, but that didn’t – that went and disappeared out of the window. They were lovely crisp rolls and nice cheese, I used to love those. Anyway, erm, but mainly at lunchtime we all went home for lunch ‘cause we – when I say all, eighty per cent, ‘cause we lived locally within walking or cycling distance. And there wasn’t really the facility for a proper meal, so we had to have that when we – but that’s what we went home for, a proper midday lunch. Er, and then we finished round about five o’clock, er, although most of the time we were working some overtime, erm, usually about an hour. We’re talking of early days Jean [laughs]. And sometimes it was two hours but, er, that was in the ‘50s I would say, we were those sort of hours, erm, and they gradually went down. We lost Saturday mornings fairly early on, early ‘50s I would guess, we lost the Saturday morning working. Erm, didn’t often get called in at weekends, only some special problem that had cropped up but, er, then when I became a director I mean that was – you worked all hours and, er, had lunch at work, because you often had visitors to take to lunch and we had our own senior executives’ canteen with a directors’, very nice, directors’ dining room attached to it. And that went on, erm, till we created Westland Aerospace in ‘85 or thereabouts. So that was the sort of hours we worked. But that doesn’t include having to entertain visitors and, erm … customers and what have you.

[27:35]

Did you see many people from the outside world in the earlier part of your career?

The earlier part of my career, no, not too many, no sort of monthly at most, whereas later on it became not daily but it felt like it and they were from any – you know,
almost anywhere. ‘Cause we had our, erm, license agreements with America and Japan, so there was them involved, and then there was all the various customers, Saudi Arabia, Iran, erm, the Ministry of Defence, and so it went.

Started off this particular session talking about hovercraft and I was wondering, you know, what we were talking about, you know, when you needed to decide what to do next after the first one had worked. I was wondering what you actually saw the future prospects were being for hovercraft, you know, in this early period.

Erm, we – we had made proposals to the NRDC for, er, an SRN2 which would carry, I don’t know, it was something like seventy passengers across river estuaries and the Solent and so on. Er, and we built that craft quite quickly after the SRN1, but it didn’t have skirts then; when it was first built it was like the first SRN1, er, skirts came later.

Skirts?

Yeah, well that – an extension of the ducts with, erm, a flexible bag and a jet at the bottom of it in flexible materials. It was very difficult to make, erm, and last more than a few hours but we did in the end, but it was improved by something else later on. But suddenly, our chief designer at that time was Dick Stanton-Jones, he decided we put one of these flexible extensions four feet deep. We’d been experimenting with about a foot, which even that we’d had terrible trouble to make it last more than minutes, the material just shredded flat and shredded. And, er, suddenly he decided we would do it four feet deep and we remonstrated, we said it’ll be unstable Dick, we can’t do that. But he said, ‘Well, let’s just try it and see’ and try it we did and it worked, so – but that was later on after SRN2. We thought that if you had a two foot hover height you could go out in four foot seas pretty reasonably, about twice the hover height, that’s what the N1 had shown. But it wasn’t quite as good as that and it depended on the wave frequency and all sorts of things, so – and we built a military stretched version of the SRN2 for the military, for the Ministry of Defence, and very quickly we fitted them with these – when we made these four foot skirts work we fitted them with four foot skirts, both of them. Er, that takes us to sort of 1963, so about a four year period that we’d developed these skirts enough to have been fitted to these craft. But then, er, various people including the company, more or less together
in the sense of time, decided that we should build a big one for crossing the – the Channel and a – I think it was called a green paper, was written about this by – we were then owned by Westland’s of course, about crossing the Channel by hovercraft and started to think about SRN4. Erm, but in the meantime we had decided to make small hovercraft that were very fast indeed like – I think the N2 was as well. We were talking eighty knot craft by that time, which they were, and it was decided by the Westland group board that we would set up an actual, erm, build line, what’s the – what’s the right phrase? A production line of hovercraft called SRN5, which was quite a small one, would carry eighteen passengers. And, er, we very soon found that we could, without much decrease in top speed, er, stretch that by ten feet and twenty passengers to thirty-eight, er, which we called the SRN6, and that was introduced into the SRN5 production line. And mixed into that was the fitting these same craft with these deep skirts, flexible extensions, whatever you wanted to call – call them. And, erm, so the N4 became possible instead of having enormous power to get a big hover height of, say, four feet in order to go over eight foot waves, and off it – off we went on the design of SRN4.

[34:40]

I think that seems a good place -

Point?

To pick up another day.

Yes, okay.

I have one very final question actually.

Yeah, go ahead.

What did you think hovercraft would be used for at the start?
Oh – oh, we were even talking possible big freighters going across the Atlantic, oh yes, but high speeds you see. Our idea, proven by theoretical calculations, er, was this business of if you can – if you want to go over ten foot seas you need a five foot hover height and you can go at eighty knots. The eighty knots was what was required to make it economic, and that’s where hovercraft have changed now. They’re more like forty knot vessels and they’re built mainly because they’re amphibious.

*What was the relevance of the eighty knot speed in particular?*

Oh, economics. Er, the faster you go the more efficient the craft was, and it had to be that sort of speed in order to be sufficiently efficient, relative to a ship. That’s the little bit that seems to have got lost.

[End of Track 7]
Track 8

I was wondering if we could talk a little bit about how your family developed over the course of the '50s and '60s.

Oh, that is an amusing tale really because, er, we have three children all in the – we were married in, er, 1950 and every two years or so we – we had a child, so we ended up with three, two girls first and then a boy, er, Lesley, Jenny and Douglas. And when we had not long moved into our first house, er, a council house, when Douglas was born and he was delivered at the house. So our family doctor came and visited us and when he left he said to me, you know, you’ve got to beware the Ides of March. And I thought what the hell’s he talking about? And Jean and I talked it over, then we realised that between the children and between our marriage and the first child, it’s almost an identical number of days [laughs]. That was one of the first occasions that I discovered that I discovered I was a bit of a freak.

[Laughs]

And they’re all – they all got good degrees, Douglas in engineering, not forced by me. Erm, Jenny’s got – got the first art degree in the country, at Bristol. And Lesley at Stirling, er, graduated in English and they – Douglas runs his own company, Jenny and her husband run an upmarket plastering company. They had a contract to repair all the damage done to St George’s chapel in Windsor Castle, that’s the sort of level of their work. And Lesley is – er, runs a department of Toulouse University, so we can be pretty proud of our three kids, especially as they’re nice people.

What did you want for them when they were growing up?

I didn’t want anything for them really, no I – we let them go their own way. We didn’t force them in any direction or even think of or attempt to do so. No, they’ve gone their own – their own way. Douglas got interested in environmental engineering and that’s what he’s specialised in.

Environmental engineering?
Yes. Well, you know, that’s – well, it’s the first thing of his, creating an environment in the house, for instance, and then it goes on to all the green things that people talk about and so on. He did that at Southlands University in London.

*How did your colleagues take to you getting married?*

Oh, all my colleagues were tickled pink and of course they loved Jean. She – she can charm the, you know, I won’t say the phrase. Erm, no, everybody was delighted except my mother and father who said it was too soon and I shouldn’t do it. And, er, I’ve got a feeling that they encouraged the training superintendent at the firm who – to try and persuade us not to do it. And, erm, he sent for us and put us on the carpet, but we stuck to our guns and said we wanted to get married and we couldn’t see why that was going to interfere with my education and career, and it hasn’t. But, no, it was not favourably received by my parents. Not – they loved Jean, there was no – no objection to Jean whatever but, er, they didn’t realise that for two years we were actually quite well off because she had – she had a job and, er, and I had a good grant and we were okay. We enjoyed London for a couple of years but then it got a bit hard when our first baby came along of course. Erm, but that didn’t interfere with my work at the university at all.

[05:45]

Er, we left university in 1953 and we had two shillings and sixpence, as the monetary units were in those days [laughs], between us, and a baby and a suite of furniture, our sole possessions. But fortunately my grandmother let us have a flat free in her big house and so we were very comfortable and we didn’t have any problems really. We were very lucky, have been all our lives.

[06:25]

*What was family life like on the Isle of Wight?*
Well, it was fine. I mean plenty to do on the island and of course in the summer you – you couldn’t wish for a better place to live. You’ve got 150 miles of – of coast on this little island, so – 150 miles? Why does that sound too much? Er, it can’t be far off, erm… [counting]. No, it’s about half that, but nevertheless it’s a long way and a lot of that is a good – a good – along a good beach, so we were able to enjoy summers very much indeed bicycling. And we had an Austin Seven Chummy that had magneto ignition and I maintained it and, even changing tyres, and we operated that for fifteen years just in the summer months.

**Why just the summer months?**

Well, because we couldn’t afford the insurance and the petrol during the rest of the year, and so it was on fire and theft for the other nine months of the year and up on stilts, and that’s when I did the maintenance and, er, we went everywhere by bus or bicycle. Of course the kids couldn’t bicycle when they were small but, er, we reckoned that we went on one trip with my friend and colleague, Albert Weeks and his family, and we claimed that we beat the record for the number of people on an Austin Seven Chummy. We claimed ten – ten because Douglas had, not Douglas, Albert, had two children and one on the way, and we had two children and one on the way and then the four adults, and so we reckon we carried ten people on this [laughs]. Chugged up one of the steep hills in bottom gear at about five miles an hour [laughs]. Oh, they were good times, they were, so that’s my family.

**What about other interests outside work, was it just family or –?**

Oh, no, no I – we sailed our sailing boat, built with Tony Dorey, er, played cricket in the summer. Summer evenings I – I never played in the daytime. Sorry, I don’t mean that do I? Erm, obviously played in the evening daytime but I didn’t play in the afternoons, but I did play hockey, er, in the winter Saturdays, erm, and we had a very good hockey team, very pleasant crowd of blokes actually. So life was very good, very good indeed, plenty of interesting work, as I’ve already said.

[10:25]
To return to the work part of this for a bit, I think last time we got about as far as the idea for an SRN2 hovercraft.

Yes.

What was that –? How was that a development from the first one?

Well, in the sense of the system, the basic system, it was very similar, er, but we decided to make it more like a boat, and it had propulsion with propellers and very big centrifugal fans to generate the air cushion. But the propulsion and air cushion were entirely separately powered, it was driven by four engines which were not very reliable. I can’t remember, I’ve lost what those engines were initially, but they – they weren’t reliable enough, erm, and so we decided that the – the Ministry of Defence were interested and we made a military version of it powered by Gnome engines and, er, it was about 900 horsepower each. And, er … that worked very well indeed on that craft, the ministry operated that for quite a few years from, er, Brown Down over on the mainland where they established the interservice hovercraft trials unit and that was – that had already operated the N1, erm, and they took over the N3. And they also bought N5, the small eighteen seat hovercraft also with a gnome engine but only one, and that was encouraged by the Westland group, I must say. The Westland board, main board, they encouraged us to establish a production line for the SRN5 but we very quickly realised it could be stretched ten feet with improved over wave performance and a skirt, four foot deep skirt. Er, and the – the passenger capacity went up to thirty-eight and it was operated across the Solent by Hovertravel as a passenger craft, which it did for many years. Had a reputation for being noisy, which we had to cure later on.

[14:00]

What sort of support did you get within the company for hovercraft?

Well, the – the company at that time of course was entirely Westland’s, we were the Saunders-Roe division of Westland’s until 1966 when, er, the National Research and Development Corporation, together with Vickers who were also making hovercraft,
formed British Hovercraft Corporation, er, which was initially partly owned by all three, and all three had directors on the board and – but later on Westland bought out the interests of both Vickers and the NRDC, so it very quickly became a Westland subsidiary. But the Westland board definitely encouraged hovercraft and provided a lot of finance.

**Was it expensive to develop?**

Yes, because you – when you sold the craft you, erm – you could get staged payments and then a final payment but those staged payments didn’t pay the total amount of expenditure on design and development. So you had quite a big measure of, erm, funding that had to be supplied by the company and that was very willingly, in fact almost forcibly [laughs], supplied by Westland if you see what I mean. They wanted to do it and of course you – setting up a production line costs money ‘cause you – you haven’t sold all the craft that you’re producing so – and all the work in progress isn’t funded externally, so you’ve got quite a price to pay to set up a production line, but that was done by Westland’s, they were excellent.

**What about the other people you were working with? How did they feel about working on hovercraft after –?**

Most were, erm, very encouraged and interested and wanted to be involved. There were – there were a few who were highly dubious about it as a concept and, er … neither fish nor fowl, so to speak. There weren’t many but there were some.

**Why dubious?**

Sorry?

**Why dubious? On technical grounds or commercial grounds or what?**

Devious you said?

**Dubious.**
Dubious?

Sorry.

Yes, on technical grounds that, you know, why do we want such a vessel. They understood the amphibious side of it but that is quite limited, you know, it’s got – the land’s got to be fairly flat. The big advantage is when it’s marshy and, er, inaccessible flattish land, and then you can – it comes into its own then without a doubt. They understood that, but that’s about it, they didn’t see that it would ever replace the ship and – or the aeroplane. Which it, in fairness, it hasn’t entirely done so, of course.

[18:30]

*How did your own role change at the start of the 1960s?*

Er, the start of the 1960s?

*Hmm.*

Erm, no not very much, I spoke about the work with Northern Ireland didn’t I?

*Hmm.*

That was the early ‘60s, so I had plenty of other work than hovercraft and, er, I – I was involved in the continuing development of the design requirements for hovercraft with the – there was a committee formed by the Air Registration Board to – to do it and look into it, and I was deeply involved in that sort of thing. But, no, I had plenty of other work and, er, we were still working on possible projects of one sort or another including rocketry, developments of Black Knight, that went on through the early ‘60s. There was a lot of involvement in, er, designing a British and a European satellite launcher, three stage device, which ultimately culminated in the British government going it alone with Black Arrow, a straightforward development of Black
Knight. And then in 1966 I was made chief designer of our establishment here in East Cowes, which was then – by then I was British Hovercraft Corporation’s first chief designer, and we got this Black Arrow design from – the Royal Aircraft Establishment funded it. A month after I became chief designer we got the contract for Black Arrow, so I was straight, yeah, into that and we were – I had begun in – er, about eighteen months previously I had been made chief structural designer and was in charge of the structural design at the early stages of the SRN4. And when I became chief designer I remember vividly being given two instructions. One that the SRN4 weight without payload or fuel, the basic weight mustn’t be more than 100 tons, and that I had a staff of 700, and I was given two years to reduce that to 300 and with no finance to do it, to encourage and find jobs for 400 staff. Didn’t quite do it but it got pretty close.

Why the need to scale back?

That estimate’s done by members of the Westland board into what they could sustain.

Did you know you’d have to make those sorts of choices when you actually got the job, or before you got the job rather?

No [laughs]. No, that was a little present on the day [both laugh].

How did you react to that sort of thing?

Well, just life was like that. I mean don’t forget we’d been through the – er, some six or seven years earlier we’d been through the trauma of the SR55 cancellation and the sacking of people, so I’d – I’d been at the other end of it, so I knew exactly what it was like, and the idea wasn’t new. And I’m sure it was just a financial calculation.

[23:30]

There are a few bits I’d like to pick up on here but in terms of getting chronologically done I was wondering, chief structural design, what sort of job is that, what do you have to do?
Erm, well, all the basic – you start off with the basic ideas of how – how you’re going to build this thing and then you have to develop that and see to it that it’s drawn and that the drawings do convey the principles you want, er, and that things like – I alluded to it just now, that because you’ve got to lift a hovercraft, the weight is obviously important, er, so the structure mustn’t be too heavy, er, things like that. And then cost, er, I had some difficulty with that because the British aircraft industry was brought up on what was called cost plus where, erm, the government funded the company and, er, paid what was the costs that you incurred and plus a standard profit. And that meant that the staff never knew about costs, you know, it was just accumulated and then the government was charged and you didn’t need to know. So when I was trying to make sure that the cost of the N4 structure wasn’t too much I was trying to get out of the department the – what structures had cost, and that was refused point blank, you can’t have it [laughs]. I don’t think they had split it all up anyway but I don’t know. Anyway, it was – the financial side of it was kept from – from the staff in the aircraft industry at that time and, er, so I couldn’t get any costs worth talking about but if you’ll remember I had spent quite a time doing costing in the factory, so I had a pretty reasonable idea of how to do it, how to estimate it, and that’s what I had to rely on as the chief structural engineer.

*How does one actually design something as big and as complicated as a hovercraft without really knowing what things cost? Was it just something that you didn’t have to worry about or …?*

Well, er, initially estimates of costs were – were done on weight. If it weighs so much then it’s going to cost so much, and figures like that you could get hold of, erm, but they were estimates rather than actuals. Er, all you knew is that the total added up, so … you started with what’s it going to weigh, which had to be done by rough – rough estimates, er, and a rough idea of what the structure was going to be like. Erm, but then it was really just a question of your – your knowledge of, erm, what things did cost.

*Were there any other challenges you’d have to deal with as chief structural designer you hadn’t had to before?*
Er, not – not really, because you have to be deeply involved – as a stress man you have to be deeply involved in the design of the structure to be able to make sure it’s strong enough. You can’t make sure it’s strong enough without knowing what the design is and what it’s like can you? I mean, so automatically a stress man has a pretty hefty knowledge of structural design, automatically.

[29:00]

But that only lasted just over a year and when the chief designer was, er, made – I think he was made assistant – deputy managing director. Was he, or was he managing director? I’m not sure but he was – he was one or the other, in charge of the place anyway. Erm, no he was made managing director, that’s right. And, er, he had to relinquish the chief designer’s post. He was also technical director at the time.

Who was that?

Richard Stanton-Jones, hyphen, Stanton-Jones, good guy, very good designer, nice chap, we got on very well indeed, we became very good friends.

What was he like?

Pardon?

What was he like?

What was he like? He was about the same height as me, hair fairer, more of it than me [laughs]. Erm, pretty good looking sort of chap, very pleasant, very pleasant, could really turn on the charm when he wanted to, which was most of the time. And that’s about it really.

And how was he to work with?
Excellent, you could sit down and discuss what – what to do and reach a conclusion quite quickly and get on – get on with it. And he left me to it, he never interfered at all ever, and I – I really applaud him for that. Because he’d been chief designer, you would have thought he would have – er, you know, what do you do with that, why are you doing that, sort of thing, but he didn’t, he never interfered at all.

_Talking about the role of managing people as well, when did you first get people to manage yourself?_

When do I first?

_When did you first start managing other people?_

Oh, er … oh fairly early on. In fact, erm, when I first came back, erm, from university – I told you I was – one of my first jobs was to spend three months educating engineers into – try and turn them into stress men. And then that was, I forget whether it was three months or it was – it must have been six months, and when I went back into the office I was immediately given one of them to work [laughs] – work with me. And, erm, then there was a stress man at the Eastleigh helicopter factory who didn’t have enough work and he was brought over to work for me as well. And, er, that was interesting because I – I had to check the design of the bulkhead behind the pilot of the SR53 which had rails going up it to hold the pilot’s seat and to run up it when it was, er, ejected. And, er, this chap came – brought the drawings to me to be signed. Er, he signed the drawing in one place and I signed it in another, and I took one look at it and with my vast experience at the time said, that’s not right, that’s crazy. And he said, ‘Now come on, let’s look at the calculations,’ so we looked at the calculations. And he had scaled the, er, structure from the drawing and forgotten that the drawing was half scaled, so he’d treated that as full scale, so he’d made – so I said sorry, you know, you’ve ballsed this up, you’d better go and do it again [laughs]. And we had a good laugh about it because it’s such a silly mistake and off he went, and we didn’t fall out or – and I didn’t say you stupid idiot or anything like that, erm. I’ve never been like that, my attitude to mistakes has always been what are we going to do about it, not why did it happen, how stupid it was or – I’ve never involved myself in that, I always want to know where you’re going to put it
right, what do we do. And that’s what – I said you’d better go and scale it up correctly, and so he did.

[34:30]

But that’s the sort of thing that another chap I was given, erm, he – [laughs] he had not understood the basic definition of what stress is. He’d got it all wrong and he came to me with his calculations and there he had the load times two divided by the area. And I said, ‘Four times two?’ He said, ‘Well, there’s one at each end’ and I said, ‘what you’d better do is go away and tell me what the load distribution along that strut is with a load just at one end.’ He said, ‘Well, you can’t do that,’ and I said, ‘yes you can, it’ll go off into space.’ I said, ‘And I want you to give me the stress distribution over that member with a load at one end only.’ And he went off and he came back and he’d done it properly, a line like that from – from the P at that end to nothing at this end. And, er, I said, ‘Now do it the other way round,’ and he came back with it that way round. I said [both talking at once], ‘Right, add the two together and what do you get?’ And he said, ‘Oh, P all the –’ I said, ‘What’s all this 2P that you’ve got down here?’ ‘Oh, my God’ he said. Now that was a chap who’d got a degree and not understood what loading does through a stretcher [laughs]. Oh, dear, so he was – we fired him in the end, he was – he was hopeless. How he’d got a degree, I don’t know.

Do you think there was a gap between the sorts of things you get taught in university courses as regards aeronautical engineering and the actual practical hands-on activities?

Oh, yes, I was very fortunate to have been in the stress office first, oh yes, I do. I mean that’s fundamental isn’t it? I mean what is – what do you mean by stress? [Laughs] I mean what is it? It’s –

What is it? [Laughs].

It’s the load divided by – on the structure, divided by the area. Er, and that goes down to minute things, you know, to – a stress can vary across a structure. If it’s been
bending – if it’s been bent, for instance, so it’ll be more highly stressed in one part than another part, and you’ve got to calculate that and make sure it doesn’t exceed the capability of the material or structural design to – to sustain it. And that bit of philosophy never came across, at Southampton University anyway, [laughs].

[38:00]

One other thing I meant to ask about a while ago was how many women were there working with you?

Oh, not – in the stress office we had, erm, a computer specialist, we would – often in a structure you’d create a table of, er, calculating the load or something, you know, and you’d – you’d split it up in a table to add up or whatever. And we used to employ a lady to – on a simple adding up machine, and they were wonderful, they’d do it at three times the speed we could, erm, and we’ve give them the table and it would be column one multiplied by column two plus column three and so on. And, er – the fingers would go like this [demonstrates] over the, er – over the machine, adding it up, it was quite incredible. So we had a comptometer operator or something we called them, I think that’s the right word. And then we had a very pretty young lady we were training to be a stress man. There was, erm – I don’t think there were any what I would call real draftsmen in the drawing office but what there was, er, was – golly, I’ve forgotten what we called them … tracers. Er, there was a tracing department that special drawings would be sent in – into this department and they would ink them onto cloth, and they were almost all ladies. Er, the first lady engineer I came across was during my stay at Imperial College, one lady, that’s all, one lady engineer in the engineering department in City and Guilds. And, er, I had quite a lot to do with the, erm, Royal Corps of Naval Constructors who – they’re the people who design ships. And during my course of knowing them in the mid ‘70s, yes, erm, the – they announced that they – their first lady in the Royal Corps. But it’s expanded a bit, not – surprisingly little, there are apprent – lady apprentices taken on but they’re few and far between, certainly in our company.

Do you think that was unusual at the time?
I think it’s still usual, there’s a very small proportion of lady engineers –

Why do you think that is?

Just the odd one. It’s just the way we bring our children up isn’t it? I mean how many girls are given toy trains to play with? How many boys are given dolls? It’s just part of society isn’t it? It’s not right, it’s stupid. I mean there are very bright ladies. I mean you hear it time and again don’t you that at schools they’re brighter than the boys, so why should it be? It is just the way – way society has arranged itself to bring up, er, children.

You mentioned that there was one woman you were training as a stress man –

Yes.

Or stress woman I suppose –

Yes.

Earlier on. But how did she get on with the rest of the people there?

Oh, fine yeah, fine yes. She asked me to train her privately and, erm, I did it and, er, she eventually, a few years later, left the firm, I don’t know what’s happened to her. But, er, she paid me with my first really good slide rule, really good expensive slide rule [laughs].

[43:15]

What makes a good slide rule?

Erm, I’ve got it somewhere, er, where the hell is it? Erm, well, first of all it’s very – it’s a bit thick and stable, it’s nicely, er, finished in white with – and the gradations are easy to read and, erm … just sort of a bit of luxury really, that’s all. The most
important thing is it’s thick and stable and easy – easy to run the slide up and down. Do you want me to find one and show you?

*Now I was just wondering, you know, is there something, you know, that makes it a good slide rule as opposed –*

Well, its logarithms –

*To a bad done.*

It’s – basically it’s a logarithm table, so instead of when you multiply things you add things, er, by means of a logarith – a logarithmic scale, so it’s not a uniform scale like a ruler is.

*How much do you typically use a slide rule in what you do, is it –?*

Well, in those days all the time, oh yes, you were using it all the time. You could buy them up to twenty inches long, this sort of length.

*What’s the advantage of a bigger one?*

It’s a bit more accurate.

[45:40]

*When you became chief structural designer were you managing more people then as well?*

Oh, yes, like four times as many. That was roughly the ratio between draftsmen and stress men, was roughly four to one I would say, and I was responsible for all the draftsmen, all the structural draftsmen. I wasn’t responsible for the electrical draftsmen and the, erm, hydraulics people, but as soon as I became chief designer I was of course [laughs].
Where were you actually working when you were chief structural designer?

Where was I working?

_Hmm._

Oh, out in the drawing office.

_Did you have your own office or was it –?_

A very – a very small one, er, just that I could – enough to interview a couple of chaps in it.

_Can you give me some idea of what this wider space looks like with the drawing office and your office?_

Oh, well, the drawing office was a – if you can imagine Osborne stables, er, with buildings around a square and so in the – in the middle of this big building which partially housed originally, not originally, but the Royal Naval College, some of it two storey, some of it where the horses were and some where the carriages were, so you had these four sides and a big – a big courtyard in the middle of it. We roofed that in and so all the draftsmen, er, were in that big area and round the edge were offices for various people. And the stress office was in one of the actual buildings, erm, so how – how big would that be? [Counting] probably something approaching 100 feet square and each chap had a desk of drawers and his drawing board propped up at an angle on top of that, big drawing board. I’ve got – I’ve got one of them down there which is set up in my shed. Erm, and it’s got the hard edge and the – and the T square on it. I can show you the T square, I’ve got it upstairs. So – and then, as I say, there was the chief structural engineer, the chief mechanical engineer, the chief electrical engineer, in a row of offices along one edge. And that’s it really, and then the stress office was a smaller office with an office for the chief at one end of it along another side, that’s roughly it.

[49:00]
How much contact is there between the different bits, you know, the drawing office and the stress office and the –?

Oh, continual contact ‘cause you – the draftsmen can’t very often just go ahead and draw the whole component, whatever it is, he needs to – to know whether the dimensions are big enough or are they too big or whatever, and he needs advice. And the stress man works alongside him in the sense that they’re both working on the component at the same time, and then the finished drawing is sent to the stress office to be signed as strong enough. Do you want a coffee or –?

I was just about to say I’m going to have to pop this on stop anyway, so –

Oh, right.

I’ve just filled up the card.

[End of Track 8]
Track 9

Right. While we’re talking about hovercraft I was going to ask you about Christopher Cockerell. Can you describe him to me?

Oh, erm, I suppose he’s a little shorter, six feet tall, slim, erm, moustache, erm, more hair than me, considerably. Erm, probably I’d say he was – I’m trying to think when he was born, 1912 I think [pause] yes, so he’s some fifteen years older than me. Erm, very upright, erm, didn’t suffer fools gladly but could – was a very much an old English gentleman and when offended would sort of put his shoulders back and stand up tall and, er, not say anything for a minute or two [laughs]. Erm, but he certainly could stand up for himself, and very persistent, terrific imagination. A trained electronics – electrical and [stroke] electrical engineer, erm, spent most of his working life at Marconi, er, especially during the war years, inventing all sorts of things like radio direction finding and things like that. He was – he was the Marconi inventor for quite a number of years until he decided he’d had enough in the – somewhere around 19’ – early ‘50s, of the last century, when he decided to leave Marconi’s and bought himself a little shipyard down near Norfolk, er, sorry near – not Norfolk, Norwich, and then he couldn’t stop the bug of designing things and inventing things and so he was designing boats for, erm, travel round the Fens and then he decided that he – that there must be a way of lubricating boats to make them more efficient. So he started experiments with blowing air under boats and eventually invented the hovercraft principle.

[03:50]

When did you first encounter him?

Erm, well, he came to the company to persuade them to do some research under his projects and then to produce the SRN1, and bought himself a house in East Cowes when we agreed we would do – do things, and we were well equipped for testing with, er, wind tunnels and water tanks and so on. Erm, and he set up – he persuaded NRDC to do some funding and eventually to set up Hovercraft Development Limited,
which he did in his house called the White House in Victoria Road in East Cowes. 
And we’ve recently unveiled a little memorial to him there, erm …

_Do you mind if I adjust you one second?_

No.

_So do you remember when you first met him?_

Erm, he – it was during the course of the design of the SRN1 but I wasn’t at a very high management level then and the first time I really saw him was when we did the press release and showed SRN1 to the public. And there’s this incident that he’d have loved to record that, er, he was a bit of a chap, understandably, for wanting to present himself to the public as the inventor and the company, and the board anyway, didn’t want him to be at this press release because he – they felt he would rather take over. But he heard about it and, er, persuaded the guard to let him in and then he – he went forward and grabbed a hold of the SRN1 when it was hovering and [laughs] pushed it around a bit. There’s a picture of him doing just that when he wasn’t supposed to be there. Erm, and later on when I got to know him much better, I didn’t know him at all then, he – I said him, ‘Look, you know, it’s all very well your story but you could have got that policeman on the gate the sack because he’d been told not to admit you. You persuaded him in your usual persuasive manner to let you in, you could have got him the sack.’ ‘Oh, my God’ he said, ‘I didn’t intend to do that.’ I said, ‘No, of course you didn’t but you might have thought about it.’

[07:20]

Anyway, er, he – that’s the sort of chap he was and in later years he was, I suppose probably about five years later, something of that order, maybe a bit more, erm, the company persuaded him to become a consultant to the company responsible to me. And, er, so we had five years of working together. He – he didn’t actually come up with any ideas during that period, I must say, on hovercraft, but he did – he invented rafts for getting energy out of waves, he got a real bug about the world running out of fuel and, er, this was one. And then he invented a machine which he reckoned could
… create energy from a machine. I tried hard to persuade him that was daft, that the law of conservation of energy says you can’t do that, but he went ahead with it and eventually I went right through the design for him and managed to prove to him that what he was actually designing was a mechanism, that you put power in at one – the load in at one end and out at the end, other end, could come a mechanical advantage but not power unless you put power in at the other – at the beginning, so I eventually convinced him of that. It took a long time and he – he wanted Jean and I to go and live at Hythe near him and become the director of the firm to create these machines and [laughs] – anyway we – we talked him out of that. But the interesting thing was, later on when he died, just a couple of days before he died, we visited him and he was by that time unable to look after himself and he was in bed, bed clothes piled on top of him, ‘cause he said he was so cold. And there he was designing an electronic means of creating energy [laughs] and a couple of days later he was gone. But we got on very well indeed and we spent many happy hours talking to him about this sort of thing, er, and Jean would be sitting nearby with Margaret, his wife, and they’d be talking about literature and all that sort of thing, and Christopher and I would be a yard away talking about all sorts of inventions and things. They were very happy times and that went on well into my retirement.

Could you give me a flavour of some of the topics you used to talk about?

Well, it was this business of how can you create energy and how can we make it work and where – where could we build it, all that sort of thing. Erm, and we’d digress from time to time on some other interesting aspect of engineering [laughs]. They were very happy days.

[11:30]

Can you give me –?

When you got to know him he was a very nice chap, very nice chap, and Margaret was a bit special to him. Very tall lady, she was.
You mentioned at the start that the company were a bit reluctant to have him around on that press release. How were the relations between the company and him following that?

Oh, well, that was – Christopher was – very soon after the SRN3 was – it was mainly talking to me, and we got on all right. Neither of us stood any nonsense and just, er, would talk straightforwardly to one another without any acrimony at all. We got on very well from the beginning, but we could contradict one another [laughs] without acrimony, as I say.

On what sort of topics?

Well, that was on hovercraft design. I mean when I first met him on that I was – I’m not sure if I was actually chief designer or not, I think I must have been, and he was forming a company with an old friend called Hover Transport Limited and he wanted to – the company that he was forming, the idea was that he’d purchase an SRN4 and operate it across the Solent, er, which was actually a very good idea, it was highly suitable for an N4. Anyway, that didn’t happen for other reasons but I was summoned to Yeovil by a Westland board, main board director, to meet him and discuss the SRN4 at the time. And he started off the meeting by saying, ‘I want it to be understood that the SRN4 has been designed by an aerodynamic engineer and a structural engineer, and has nothing to do with the commercial world,’ to which I said that I didn’t agree with that. And it’s true that it had been designed by an aerodynamicist and a structural man but I didn’t consider there was anything wrong with that, and that it was in fact a very good commercial machine. And the conversation went on and in the end he accepted that the design was in fact okay and that, er, he was just going to go ahead and purchase it. But the government intervened and, er, persuaded British Rail that they were to operate the SRN4 across the Channel and, er, they put down the cash to purchase the first machine, and so Christopher dissolved his company, and we never operated it for across the Solent [laughs] which is a shame.

[15:00]
Do you think there was a difference or approach when it came to hovercraft between Christopher Cockerell who was, you know, the inventor of it and yourself who is, you know, a professional engineer –

No.

To actually getting the thing working?

No, only in detail, not – no, not at all. It was a very amicable relationship. Erm, he accepted that we knew how to design machines that would work and it’s just a question of whether it could be improved or not.

I always sort of wonder about the inventors in companies that end up making their thing, the relationship between the two is an interesting one.

It is, you’re quite right, it is. Erm … but I don’t know any – I’ve never experienced it other than with Christopher Cockerell and that was fine, no problem with that. I’m sure he would have loved to have gone into the design department and down onto the drawing boards but there was no way I was going to let him do that. You couldn’t – you couldn’t have that, that wouldn’t work.

[16:36]

Is that something he accepted as well?

Oh yes, oh yes.

The other little group that popped up in the course of talking about the early hovercraft were of course the NRDC and government, and I was wondering how were they to work with.

Well, they set up Hovercraft Development Limited, er, with one of their own board members on the board of – as managing director of it, of Hovercraft Development
Limited, with Christopher as technical director, so they had total control over Hovercraft Development Limited.

Did they act as sleeping partner or an active one?

Er, they rapidly became a sleeping partner, yes, yes they did. Erm, but they would – they could be, and were, activated from time to time. I mean when we got to replacing the SRN6 with a new design, with a diesel engine in it and a much quieter propulsion, which was demanded by the local authorities at Ryde and Southsea, they – one third funded that, it was an unusual tripartite contract to do that. Erm, and it was funded equally by NRDC, Hovertravel who were going to purchase the machine, I’m talking about the first machine, and the company who funded the design. So that was a big occasion when they really stepped in, that wasn’t Hovercraft Development Limited, it was the NRDC and they – when British Hovercraft Corporation was formed. Also it was NRDC, it was NRDC who appointed the two board members that they had, and Christopher was not one of those.

Did they suggest any particular direction for hovercraft development?

No, they were very much, erm, nominal directors and they didn’t have any direct influence on it because it was run by the executive directors. I became technical director about three years later, something like 19 – no, it must have been a bit more. ‘71 or ‘72, I was made technical director and retained the chief designer post, which has actually made it quite hard work but I’d still enjoyed it.

[20:15]

Do you think the hovercraft got sufficient support from the government?

Oh, at that time, yes, oh yes, and the Ministry of Defence were very active. Oh, yes, in those early days they certainly did, oh yes.

What about later on?
Well, erm, they had established British Rail Hovercraft Limited and the Ministry of Defence, and those were the two ways in which government played a very indirect part. That was all – and now it’s direct purchase of hovercraft by the – specially the Royal Marines, erm, well, only by the Royal Marines. And the NRDC ceased to exist a long time ago and that – I don’t mean in relation to hovercraft, I mean full stop.

*Did you miss it when it did go?*

No, no, just – no, it just quietly disbanded. I couldn’t tell you when it disbanded, it just gradually faded away.

*I think it was about 1980, I could be wrong about that.*

Yes, I would – I would say. Maybe a little bit later.

*What did you think the role of the NRDC was in helping the hovercraft, if any, so –?*

Erm, sorry, my thoughts went. Look, can we stop?

*Sure.*

[Break in recording]

Go ahead, it’s all right.

[22:20]

*So you were appointed chief designer in 1966-ish?*

Yes.

*What does a chief designer actually do?*
Well, he – he’s ultimately responsible for the design and that it’s going to work and do its job properly, be safe for people to travel in if it is such a vehicle, but totally responsible that the design is a proper working vehicle thing or whatever it is. Erm, in this case it was – it would have been aircraft or hovercraft or helicopter components or whatever, and it was designed properly safe to operate, etc. Everything about the thing would end up at the chief designer unless it was an error, a manufacturing error, in the works or something like that. Now otherwise total responsibility rests with the chief designer.

_Could you give me one or two examples of the sorts of jobs you typically do?_

Well, erm, we would discuss with the team at the start, for instance, in the case of a powered vehicle you’d discuss what was a suitable engine and what type of engine and what power you needed and so on. And you would sit round the table first of all with the people under you responsible and send them off to do some work, erm, produce a report or have another discussion, er, and you’d do that with all the bits and pieces of the design. Er, and under you, you’ve got somebody responsible for each aspect, like a chief structural engineer and a chief mechanical engineer, a chief electrical engineer, erm, somebody responsible for requirements, a chief stress man and chief aerodynamicist, of all these various chief people. And that’s when it’s big things, I mean otherwise if it’s a small device like Dixon’s vacuum cleaners he would do it all himself, he’d be the chief designer, but there would be somebody who has to be responsible. And I’m talking about in law as well – as well as in generality, somebody has to be responsible.

_So mainly you’re working through the chief design of the sub-chief designers as it were –_

Yes.

_Chief electrical designer or –_

Yeah, that’s right, yes.
Mechanical designer, right. How often do you meet, is there a –?

Oh, we used to meet once a week and discuss what – what needed to be done during the week. The first thing Monday morning I’d have all my chiefs in and we’d discuss who was going where, why and what needed to be done and how we were going to tackle it. And I never allowed it to be more than an hour.

What sort of activities fill up your working day at this point?

Well, erm, most of the problem was talking to customers and, erm, requirements boards like the Air Registration Board. You’d have to be in constant touch with all these people to make sure you were doing what was the right thing to do in some cases and what the customer wanted. Er, the phone was ringing all the time, could get – it could get irritating when you were trying to do a board report or something [laughs]. But I – fortunately I’m a person who gets on well with most people and so we never had a personal problem with anybody, er, we could always get on well and have a sensible discussion and …

Did you still do any technical work yourself?

Not much, there wasn’t time. Er, thinking type technical work, yes.

What would you classify as thinking type technical work?

Well, erm, how I wanted something to be done, erm, what sort of principle. For instance, erm, choice of material, very important basic thing in any structure; that I would take direct interest in and whether to use extrusions or vents – vent structures or whatever. The principles of how it was going to be done, I would be discussing.

Did you miss the technical work?

Yes, oh yes. I mean after – you’ve heard of how I was educated, it was in me. I mean I was brought up, and the apprenticeship and everything contributed to me knowing what was what and wanting to be in it. And I certainly do miss it, yes, but fortunately
I’m healthy and I’ve developed other interests like – like the books and I’m still on various committees, er, the young enterprise, at the RNLI and various – various things. The Aeronautical Society, I’m still chairman and president of that, the local branch I mean, all those things I’m still in. So I’m still meeting people and hopefully making a contribution [laughs].

[29:10]

Did you miss the technical work at the time when you had to give it up?

Well, I – the way I had – over the last few years the way things had developed, I had gradually eased away from direct involvement in the design, er, more trying to see where the company should go rather than – but you did need to know what you were talking about in terms of how things worked and so on, otherwise you couldn’t talk about what the company could do, could you?

How much of your work was managing other people as chief designer?

Oh, a very large, very large part of it. People management, I always talked to people, er, I never got cross, ever, and I wouldn’t let the conversation go like that. I mean one chap, er, who was a bit of a grumpy chap, and he smashed a window because he couldn’t open it properly, so I sent for him and I said ‘Why did you do that Reg, why didn’t you –? If you needed fresh air and you couldn’t open the window, why didn’t you come and see me and ask me to sort it out?’ [Mimics voice] ‘Oh, well, I got fed up with that and just lost my temper and smashed the window.’ And I said, ‘Well, next time Reg, please come and see me first before you lose your temper. And lose your temper with me instead of the window. And you know perfectly well I would sort it out for you.’ ‘Yes, I do Ray. I’m sorry, I shouldn’t have done it,’ and off he went [laughs]. But that – that’s the nearest I’ve ever got to being cross with somebody [laughs], ‘cause it was silly. But as I – I may have said it earlier, I’ve certainly said it to you while you’ve been here, but my reaction to things going wrong was always where are you going to go, not why did it go wrong. You can sort that out years later if you want to but the thing is what are you going to do about it, and that was always the line I took.
Just so I’ve got an idea as well, you’ve talked about the sort of people working underneath you in this structure, who’s above you, who’s telling you what to do as chief designer?

Oh, you’re – you’re responsible to the board and of course the managing director. Erm, if you had a problem that you needed help with, financial or otherwise, you’d go to the appropriate director first, and if you couldn’t sort it out with them you’d take it to the managing director and – and then if necessary to the board. But that never happened to me, I never had that sort of problem, because I was always doing my best to sort it out – the problem out first, before it arose, if you see what I mean, if you possibly could. And I – I never would adopt the attitude that I was right and you were wrong and – that’s a stupid attitude to take, you won’t get anywhere with that.

*How much do you have to do with the board on a sort of weekly basis?*

Not much. A board member – yes, weekly, erm, and you made sure you kept in contact with them so that you weren’t some remote thing that goes his own way, no, definitely. We met one yesterday evening, didn’t we, and you saw how we talked to one another. Now he was the works director and that’s how we related to one another.

*Are there any –? When you first started as chief designer, you related that the two things you were told lose 400 staff and keep the SRN4 under 100 tons.*

Yes.

*Were those the two key concerns when you started?*

I was – I was already well enough into the design to accept that 100 ton target, I was sure we could meet it, I had no problem with that. And as – as for the losing the staff and investigating how we would do that, I would discuss that with all my heads of
department and with considerable help from the personnel department, which was quite big in the company, who would look for work and there was work at that time, so it wasn’t too bad a task. And I wasn’t worried about that because we’d already been through it on the SR35 and I’d managed to do it amicably with the staff.

[35:10]

So what were the big projects that were under way when you first started this –?

Well, the – there were the two, the SRN4 and the Black Arrow.

Could we talk about each of them in turn perhaps?

Yes, all right, whatever.

I suppose we’ve been talking about hovercraft most of the morning, it probably makes a bit of sense to look at the SRN4. What was it?

What, the SRN4? Well, it was an amphibious hovercraft designed to operate outside of ports, erm, on any accessible flattish piece of land. Erm, in fact British Rail chose to operate it right inside Dover harbour, which was rather – but they made a special terminal for it, er, to take passengers and cars across the water in the most efficient way possible other than flying. And so that inevitably meant really short routes, and we had British Rail as a customer, our first customer, and then Swedish Lloyd created a company called Hoverlloyd to operate from Pegwell Bay near Ramsgate – I’m sorry.

I actually just check every now and again just to check it’s still doing everything it should, so –

No, I had my hands up as far as – and, erm, so we – this was a newly formed company, so we had to talk to them about the requirements and what they could do with the craft when it was finished and so on, it was all a very busy period indeed.
How different –?

So I was involved in much more than just the design [laughs].

How different was the SRN4 to the previous hovercraft?

Well, there were – the only difference between it and the SRN2, erm, three and five, which were previous, er, a) it was much, much bigger and b) it was much more efficient, partly because it was bigger, erm, partly because of the – the actual design was in a way simpler, easier access and all that sort of thing with big bow and stern doors that – for access of the cars and big passenger doors. But you were straight in to whatever it was, whether it was the – if you look at the design of an SRN2 it’s bitty, you know, there’s a bit here in the front end and a bit in the back end, and in between there’s a pylon with an air intake going down through the craft as well. We were able to make it much simpler. And the fact that it was bigger meant – meant it could go over bigger waves obviously, er, that’s really – really it. And it was more efficient than a ship to do the same job, and that had a great deal to do with speed, the fact that it had an eighty knots top speed. And in fact the SRN4 still holds the cross Channel record, er, speed of – an average speed of sixty knots, and that’s quite something –

How fast –?

And that record still holds.

How fast is that compared to a typical car ferry across the Channel?

Oh, a typical car ferry would be lucky to average about twenty-five knots when – the time it’s docked and all the rest of it.

[39:30]

What are the key issues in developing a larger hovercraft like that?
The key issues? Reliability I would say, and of course the safety of the passengers, that they could get off the craft easily and quickly, and safety from fire and so on. So I would say safety and reliability are the main things you have to watch for.

*Just thinking about Christopher Cockerell’s comment about how it was designed by, what was it, an aerodynamicist and a structural engineer—*

Yes.

*How true was that, you know, how—?*

How true was it? Well, it was, yeah, it was true, but we weren’t idiots. I mean we – we did understand that passengers had to get on and off and you had to dock it and you had to operate it, so it – it was just Christopher’s way of opening a meeting really [laughs] that’s typical of him.

*How many of them were built?*

Six.

*How successful were they?*

They were very successful, yes, they were. The – the only aspect that, erm, could have been better if they – it existed, was a more efficient engine. We were using the Proteus, Rolls Royce Proteus engine, which was designed in the – towards the end of the Second World War, so it was a very old early design of turbine. And, er, the fuel consumption was not that good, quite a lot worse than a diesel engine, for instance, but in those early days that we’re talking about fuel was quite cheap, so it didn’t matter that much. But when fuel started to get more expensive, after thirty years of operating the craft, the operators decided that it had become too inefficient and they want – they looked at replacing the engines but there wasn’t anything on the market suitable, and diesel engines are so much heavier. I mean the – when we designed our first diesel engine hovercraft, the diesel engines were about five tons whereas the – the turbine engine that we were replacing was 500 pounds. There’s that much
difference you see, a colossal difference, and when you think you’ve got to lift that weight you can see why there was a problem. So the diesel engine hovercraft ended up with a maximum speed of forty-five knots, it’s something like half, so they really were only efficient because they were operating a route where it had to be amphibious like the Southsea to Ryde route where, erm, there is no harbour, well, no harbour big enough to take a ship. And there it justifies itself because it’s amphibious and with a short route. The fact that it does an average speed of forty knots against sixty knots isn’t very important, it’s only a few minutes, but otherwise a hovercraft is efficient when it’s eighty knots or more, compared with a ship.

[44:05]

Did you expect to sell more than six?

When we started, yes, we did but the – as I say, events overtook the, if you like, inefficiency of the Proteus engine and fuel costs had shot up.

This is in the –

But that was thirty years later, there just weren’t the routes, the short – short routes suitable for the SRN4. When I say short I’m talking up to, I don’t know, shall we say fifty miles. You know, those great discussions across the great lakes like Lake Michigan and north of Chicago for instance, there was all that talk of that but it never – it never happened. People found ways of getting round it.

You mentioned that you were also responsible for talking with a lot of potential customers and –

Yes.

What sort of customers?

Erm, well, they tended to be mainly from developing countries where – where, erm, there wasn’t that much transport of something like – three countries come to mind
straight away, erm, Saudi Arabia, Iran and Iraq, er, with their long coasts, and hovercraft are extremely suitable for those areas because they could go and land in the coast any – almost anywhere. Iran, we were close to, erm, selling a mine countermeasures Oran – Oran? Muscat that’s where I did that picture of, er, the old harbour at Muscat. Oman, it is Oman isn’t it?

*I think so.*

Yes. I don’t know why I’m doubting it.

*How does one pitch hovercraft in sale terms?*

How, sorry?

*How does one sell a hovercraft, what’s your pitch as it were?*

Well, usually they approached us, you see, and said they wanted a hovercraft for this purpose, would ours do it, that’s how it began. The customer came to you, or you went and asked him did he have a requirement for, you know – in military or quasi-military terms it was easy because here you are, this – here’s a vessel, can you use it? But more often it was the customer, having heard of hovercraft, came to you and asked you, er, could you do this, then what does it cost and then to what to buy and to operate.

[End of Track 9]
Track 10

Shall I get going?

Okay by me, all means.

You mentioned that amongst the customers you were trying to interest in hovercraft were Oman, Saudi, Iran, places like that.

Yes.

Did you have to make like visits to them or –?

Oh, yes many, oh many visits, yes, and make presentations about what he craft can do and how it’s maintained and what bases you should have, all that sort of thing. And, er, we were very successful with sales in all of them. We would have gone on selling the N4 – excuse me – the N4, for instance, as a military vehicle to Iran and the BH7 which is like a corner of an N4 with a power unit, propeller and fan installation, all the same. They bought six of those I think and they were going to arm them with standard armed missiles from the United States, and that was all systems go but then the Shah was deposed and of course it all fell apart. And the – the naval official we were dealing with was called Prince Shafiq who was the Shah’s nephew, and a very good naval man he was too. And, er, he had to leave the country and then he was followed into Paris and shot. Now that was a good Iranian and he was a true Iranian, good chap. Why did they have to kill him? He wasn’t doing any harm, er, and he could have done a lot for Iran. Stupid, absolutely stupid. So some of these sort of activities I really don’t understand how they get so tied up in having to destroy things and people. Anyway, it’s another story. But we – we did very well with the Iranian navy, and the Saudis, and even – sorry, in the ‘60s were still being operated in Saudi Arabia. So, yes, lots of visits.

Do any of them stick in the mind in particular?
Oh, one does vividly. We were staying in Saudi in a – I think it was a Marriott hotel outside the main – a main city in Saudi Arabia and we were chatting away and I turned to my boss who was with us on that particular occasion and I said, ‘Hmm, just look at that new lake out there Dick,’ and he said, ‘what are you talking about?’ And I said, ‘Well, it’s pouring with rain and in that dip in the road outside the hotel there is now a lake,’ so there was [laughs], which drained away very quickly but that’s the way the kind of way the water would fall in places like Saudi Arabia, amazing. Water ran down the road of course and collected in this dip but … no, I’ve a lot of very happy memories of visits, especially to Iran and Tehran. We stayed in a Hilton hotel in the north of the city and you could walk into the mountains the other side of – the northern side of the city, and you could eat very cheap caviar [laughs]. And one of the things I liked was Iranian vodka, very classy vodka that is, if ever you have a chance to drink Iranian vodka you do it because it’s very nice indeed, especially with caviar of course but that’s – we don’t want to digress too much into that.

What’s the difference between Iranian vodka and normal vodka, or Russian vodka for instance?

Much more taste, much more taste, and it’s almost, I don’t know, a funny word to use but memory says a more aristocratic taste … very different distilling process I suppose.

[05:05]

But I do remember once we walked into the mountains and I said once or twice I think that I’m interested, or was, in photography. And I had my camera with me and they took – there was a very – quite a big and certainly very posh hotel in the mountains behind, I keep saying behind, north of Tehran, and you could walk from this Hilton hotel up there. And we were about halfway up and the goods were taken up by donkey, and there was this donkey and they’d got to a little bridge which was logs laid across sort of in the same line as the stream, so when the donkey was to go across it was having to put its hooves onto the round surface of the log and he wasn’t going to go across this bridge. And there was this lovely picture of the, erm, looked like a tribesman trying to get his donkey to cross and leaning at an angle of about forty-five
degrees, pushing its behind to get it to go across the bridge. And I went to take the photograph and I’d run out of film, so I didn’t get the photograph. It would have made a really good photograph but that’s the sort of happy memory I have of visiting these places. We weren’t in a rush that was in and do the job and out again, you couldn’t, there weren’t enough flights or variation of time to – to be able – unless you took risks about your bookings to – to cut the time down but that was – that was not on, you couldn’t – you couldn’t break off a meeting with your customers, so we had – you had to give yourself time to do the job. And it would almost invariably go over a weekend, so you – you had some time that you could – and the commercial director and I were coming home at a weekend and we stopped off at Persepolis in Iran and that is a fantastic place. If you ever get the chance to go there, you go. There’s not much there but the famous staircase is there, looks as though it was made yesterday but carved – the upright part of the staircase is beautifully carved, fantastic. And anyway, so they were hectic meetings but there was always a pleasurable side to it as well.

[08:20]

What is the work side of a trip like that like? And bearing in mind I’ve never been there, I’ve no idea what the place is like, can you just sort of talk me through when you do when you’re getting there and trying to sell them a hovercraft?

Oh, well, you meet them and usually they’ll want a slide presentation of what the craft is, what it does, how much to maintain it, all those sort of mixture of photographic and tables of cost and things like that. You would make this presentation then sit down and discuss it. They were very good meetings, you know, you – before you go you rather tend to, at the back of your mind, to think of these as rather backward nations, they aren’t, they aren’t, they’re very well educated, er, they talk English perfectly and we don’t talk their language so, you know, they’re one up really right from the start. Erm, and no, it’s really well thought out on both sides. And, er, they would withdraw and come back and comment and perhaps you’ve got to go home and get some more information and come again and – and so on.

Where were these sorts of meetings actually held?
Oh, in offices in the city or at a military camp or – sometimes one or sometimes the other. With Iran they tended to be, er, out in the base or where the proposed base will be, which is usually on or adjacent to some facility they’ve got already.

*How do you get there?*

Oh, they would – they would convey you there. You’d get there – you’d get to the airport and they would provide you with the transport. Erm, the next day perhaps you had to have a taxi or they would take you again.

*And what sorts of people were you actually meeting?*

Erm, half the armed forces or the, er … tourist offices or it would vary but – but almost invariably the government official of some sort was involved, one way or the other, either military or civil. They were quite well organised, we – we could learn a lot from these – these governments and how they spend their money and how they’re looking after their nation.

*Talking about governments, did you get any help from the British government on trips like this?*

Yes, erm, frequently. It might be – for instance, when we were talking about the SRN4, erm, a historian you may have heard of for the navy called David Brown, lives in Bristol, one of the Royal Corps of Naval Constructors, he came to us – with us on two occasions, er, or somebody from the Inter-Service Hovercraft Unit, the commander in charge would come, erm, and that was to become the Naval Research Establishment later on. The army were very interested in hovercraft when we were responsible for the northern – the north east area of NATO. And when we – that was dropped, they – the army pulled out of hovercraft but whilst it existed, er, an army man would come with you or, as I said, a naval commander.

[13:40]
Can I just pull the blind across?

Yeah, by all means.

Thanks. On the military side in Britain, did you see much of people like representatives from the navy or the army?

Sorry, say that again?

And on the military side of hovercraft development in Britain did you see much of people from the army and the navy?

Oh, yes, a lot, oh yes, I had frequent meetings with them. Er, I was even invited by a very senior meeting in London and sitting between two admirals. And the – they were making naval presentations of what equipment they had and what it was used for, and they were using capital letters and … it’s not euphemisms, what’s the word? Erm, for –

Acronyms?

A made up word.

Acronyms?

Acronyms. And I listened to this for about ten minutes and I said may I be excused please, which is not a thing you do lightly in a service meeting, they’re very disciplined meetings and you don’t interrupt the speaker. And in a bit of a slightly, very slightly, irritated tone, the chair would say, ‘Well, what is it Ray?’ And I said, ‘Do you think we could have these names spelt out for us instead of just the shorthand way you’re speaking? ‘Cause I don’t understand, I can’t follow what is being said.’ And the admiral – and one of the admirals next to me said, ‘Thank God you asked Ray’ [laughs]. I thought I’m not the only one [laughs]. But they go on, you want to listen to – and it’s like our amphibious capability and they’ll go into all the vehicles
they’ve got and how they’re used and what they’re conveyed on, and they’re all – what did we say it was?

Acronyms.

Acronyms, that’s right, acronyms, dear oh dear. So, yes, I did, and enjoyed them very much, and I was treated as an equal always.

What sort of take on the hovercraft did the navy have?

Oh, they were very with it for amphibious landings and making sure their vehicles could carry them, at that time I’m talking about, we’re in the ‘70s.

What sort of things would be discussed at them?

Well, it would be what can you carry in this vehicle, what range will it have, can it go in through the front of a landing ship dock and, er, all that sort of thing, and what engine power and so on and so forth, the whole – pretty well the whole gamut of what the vehicle was designed for and what could it do.

Were there any other applications that the navy were particularly interested in as regards hovercraft?

Oh, it was amphibious landing, land the troops without getting their feet wet. And when – and the time I’m talking about, I’ve already said that we were, as a nation, responsible for the north east NATO and so you were landing it in ice, but you don’t want your troops to get wet feet then did you? You’d want them put ashore dry and no – I suppose there were small amphibious vehicles, wheeled vehicles, but we were designing big things, like much bigger things, that could take the very vehicles ashore.

How many hovercraft did the British navy, British military generally, buy?

Oh, in twos and threes, er, I don’t suppose they ever got more than a dozen. They had N6s, had quite a few N6s of various types, and they had a couple of CC7s which was
a cushion craft design. We bought the company and, er, they – they were quite small, they really just carried people and equipment.

*Were those the sorts of numbers you’d been expecting to sell or …?*

Oh, we hoped to sell a lot more eventually but, er, eventually Westland went bust, the navy … pulled out of hovercraft and it just fell apart for a while. It’s gradually building up again now, gradually having more, erm, Griffon hovercraft at the moment in the marines.

[19:45]

*You talked quite a bit about all the different types of hovercraft earlier and I was just wondering, what sort of guides that process of evolution from one to the other. Are you sort of thinking within the company which way do you want to go with the next hovercraft, shall we make it bigger, or were you sort of having external entities as well?*

Well, you discuss that with the customer and what he wants. And, er, together you make a – a decision as to what you’re going to do and what – how much will it cost and so on.

*Did you have to travel much else apart from Iran and the Middle East?*

Oh, Japan because of the license agreement. Er, when I went there I was astonished at the first thing I found was they had bought an SRN6 and taken it to pieces. Now they – in the license agreement they were given all the drawings to make it themselves if they wanted to and yet they had their blokes take it – every rivet was taken out and put back again, the whole thing was taken to bits and put together again. Now I still for the life of me can’t understand exactly what they discovered from that, perhaps they found they could do it or something, I don’t know, and they did of course, they did make their own. In a very limited way, they – they didn’t do very much. And the same with – we visited America a lot ‘cause we – they wanted to design big, er, 2,000 ton vessels and things like that, which we got involved in. We were quoted as part of
the team, as the Belair Systems team, erm, Bell Textron they called themselves actually at the time. Erm, and – but it never got to the build stage, erm, usually money being spent on something else, usual sort of thing. Hmmm …

Who did you actually meet on the trips to the US?

Oh, sometimes at the Bell Textron factory, initially in Buffalo and then they moved all their hovercraft type work down to New Orleans, so I visited there, and visited the navy often at – in Washington. I visited Washington quite a lot, which is quite an easy thing to do ‘cause you could fly into the United States and when you’re going to New Orleans you’re coming down that east coast, so you’d stop off at Washington and then hop on an aeroplane from there down to New Orleans. Did that very frequently.

What sort of time period?

Oh, ten years I suppose I was doing that.

In the ‘70s or ‘80s then or –?

In the ‘70s, yes. There was one occasion when the final work was done on a Friday, so I decided I’d go visit my brother who lived on the north shore of Lake Superior. And I left New Orleans, erm, in a gorgeous day and flew into Chicago from there, and the weather was worsening. And I flew from there to a place called Duluth, erm, which is south west of Lake Superior, and then to fly on to Thunder Bay which is at the western end of Lake Superior and close to where my brother lived. And close in American times was actually eighty miles away, but [laughs] anyway, we landed at Duluth and I was travelling first class, which almost invariably in the smaller aircraft, or even the 747, were right up in the bow of the – the aeroplane. And from my seat I looked through the cockpit and down the runway and there was the biggest hammerhead of a storm you ever could think of right – apparently at the end of the runway but of course was further away. And, er, I spoke to the air stewardess who was sitting not far from me, I said, ‘I want to get off. If you’re flying through that thunderstorm up there I don’t want to go, I want to catch the next aeroplane.’ ‘Oh,
you’re too late’ she said, ‘we’re about to depart.’ I said, ‘Into that?’ And she said, ‘Oh, I suppose so. So you must sit down because we’re just going to take off.’ And take off we did, and we flew straight into this thunderstorm, that aircraft went all over the sky and, er, I thought my end had come’ I was quite convinced my end had come. And it ended with a terrific noise along the top of the cabin, sounded like somebody with a giant can opener going along it. And anyway, we got through the storm, survived it, and landed at Thunder Bay and were made to sit in the aircraft for half an hour, which is most unusual, because it’s a small airport and you just walk from the aeroplane to the – to the terminal building. And, er, half an hour went back and then they said we could land and I noticed that there was a guy at the doorway looking us all up and down as we went in. And, er, my brother was friendly with the boss of the airport and, erm, he had already asked what was going on, and apparently this guy was looking to see if any of us were injured to forestall claims if adverse ones were – were made. Anyway, the next day the aircraft appeared in the newspaper and apparently hailstones the size of cricket balls, well, they said baseball balls but I would say cricket balls, had pounded the aircraft and pushed in the nose of the aircraft and it was grounded, the aircraft was grounded. So how we’d survived that was a bit of a miracle [laughs].

[27:50]

But apart from that I’ve done hundreds of flights and never had a problem. Except in Russia; I went on a visit to Russia at the request of the government to support the ministry where they were discussing a possible long – long term transport – transport possibilities with the Russians and mainly in relation to travel on the – in canals, lakes, and coastal areas. And, erm, the flights were always late, one I remember was five hours late. The other thing I can remember [laughs] they – they flew us from Moscow down to Sochi which is a resort on the Black Sea and I was sitting more or less in the middle of the aircraft and, er, I felt a bit of a draft and, er, I looked down, I found I was looking straight through the aeroplane down to the land. So I called over an air – a steward and said what’s this? And he said, ‘Oh, we’re flying a military aircraft and you are actually sitting on the military ramp, and that’s the hinge, and the ceiling and the hinge has come adrift, so that’s why you’re looking down through – through the hinge of the ramp down to the ground,’ [laughs].
The Russian aircraft?

The Russian aircraft [laughs]. The military one just converted with the least possible modification to – oh, dear, anyway that was quite a trip.

What happened on your trip to Russia all together?

Oh, we were shown hydrofoils travelling on the canals, er, what the terminals looked like and what the prospects were for increasing speed and volume and so on, discussed all that. And I have to admit that senior government officials sometimes have a sense of humour but they inflicted it on me. We got into my room and we were sitting on the bed and one of them said, ‘I think we ought to discuss our proposals for 200 knot ships, don’t you?’ And [laughs] we solemnly sat round this bed in a brand new, what’s the tourist name for the tourist operator in Russia at that time? It was a part of the government, inter – no, it wasn’t Intourist, there was a name for it, anyway – and this hotel was run by that organisation, so these blokes were convinced it was all bugged and through sitting there discussing this possibility about a 200 knot ship, and we managed not to laugh. We had no – no repercussion from it but whether they realised it was a joke or not. I wouldn’t be surprised because they were – they were pretty bright, those Russian people we met, shouldn’t be underestimated.

What did you make of the state of hovercraft development in Russia?

Erm, it was mainly sidewall hovercraft, erm, but more often than not – it’s an incredible lake and canal system in Russia, all over it, you can travel everywhere almost on the canals and incredible set-up it is. Erm, and they had lots of hydrofoils, both surface piercing and completely free, er, but the conference didn’t really get anywhere much, just an exchange of what each – where each had got to. Nobody disclosed where they were going [laughs], whether there was some sequel to the visit later on, I never found out.

[32:45]
What’s a sidewall hovercraft?

Well, instead of having air pointing outwards to create the air cushion you have a wall or a sort of beam much narrower than the craft width to contain the air, which is just dipping a small amount into the sea, so you only create an air cushion between those walls by what you do at the front and the stern, the bow and the stern. Do you follow that?

I think so, yes. How did you think that the Russians were doing in hovercraft compared with what was happening in Britain?

Oh, they were way behind us. They even paid for us to make some of the big centrifugal fans that – that created the air cushion on the N4s, they bought and paid for them. The Americans were furious with us, that we shouldn’t be transferring our tech – our hovercraft technology, to the Russians but, er, I mean the principle was a well known principle of design of the – [ph] a fan, and it’s just the – I mean these fans in our craft were eleven, twelve feet diameter, huge things. And, er, so the technology was in the detail, not in the shapes.

How did the Americans feel about hovercraft when you were talking to them in the States?

Well, they didn’t like it in terms of anything we did with the Russians. Er, but we convinced them we weren’t giving away anything but, no, the Americans were really gung-ho and of course they – they built the fully amphibious LCAC they were called, L-C-A-C, Landing Craft Air Cushion, so that that could carry a full battle tank into a landing ship dock, and then you did the last bit ashore at fifty knots with the landing – with the tank on board. And they’re still operating, they were used in the Iraq war when we – both when we kicked Hussein, Saddam Hussein, out of …

Kuwait?

Kuwait, and when we subsequently invaded, these vessels were used.
How much of that is based on the stuff that happens in Saunders-Roe?

Oh, well, we designed and built the skirts for them, we were part of the team that submitted the design, we weren’t just a company that was quoted as part of it, we were actually part of the team, the Bell team, that designed the craft and we designed and built the skirt to fit – fit them. We’re not doing the replacements, that’s all gradually been absorbed into the United States.

[36:25]

I’d like to move on to talking a little bit about Black Arrow now if that’s all right.

Black Arrow, yeah.

Do you want to take a short break first or –?

No.

Okay. When did you first learn about the fact that you were going to build Black Arrow?

Oh, well, it – that was a – that’s a long story of, erm, Britain and Europe cooperating and producing a large, erm, satellite launcher. Originally it was based on Blue Streak and a second stage of a developed Black Knight, possibly hydrogen, liquid hydrogen, propulsion instead of high test peroxide and liquid oxygen – er, liquid oxygen and liquid hydrogen, so you’re talking about as a second stage of the rocket and a third stage built by the Italians, with conventional – I don’t – I can’t remember whether that – probably was going to be liquid hydrogen, it might have been a solid fuel third stage. Anyway, we were – we were concerned with the second stage and we got quite deeply into that and, you know, the material demands that liquid hydrogen, which is, you know, close to absolute zero, it’s not far off, so you’ve got to be ever so careful about brittle materials and things like that. Anyway, we did a lot of work on that, theoretical studies, and it went through various other phases. It ended up, erm, with a
division between ESA and their Ariane designs and, erm, our – our updated Black Knight, called Black Arrow, which would have been a second stage to the – our proposed European space launcher. This is a very detailed story and I’m gabbling through it, erm, but the – er, in the end it’s – ended up with a two meter diameter first stage, a slightly smaller second stage and a solid fuel third stage, to put something like a 350 pound satellite up in order – in orbit, which was regarded as rather small. But of course as technology has – has expanded that small is something quite substantial really as to what you can put into weighing 300 pounds. But also it could have been stretched, er, made bigger slightly or something to – without too much cost to, erm, put a much bigger satellite into orbit but that was never done. And so we were given a contract to design a Black Arrow that was agreed between us and Farnborough and, er, that was just in time for me to become chief designer and take charge of it. And we – I think there was two, it might – two development rounds were fired which had quite small problems. One was quite a minor short circuit, er, which caused the machine to rotate up like that [laughs]. Erm, but anyway, in 1971 we launched an experimental satellite called Prospero, into as near perfect as you can think of orbit, and very successfully. And I’ve said this many times, er, I had a telex from Australia to say they’d done it on the Friday, yippee, you know, we’ve done it completely successful. I go into our normal Monday morning board meeting and I’m informed they’ve cancelled the contract, erm, and you’re to go out and tell the staff at High Down that I’m afraid there won’t be work for half of them. That was a weekend apart from joy to sorrow in three days. Er, I had heard that that was going to happen but I’d heard it so many times before I thought, oh, that’s just another scare, it’s not going to happen, but it did, and that was absurd, it was just as stupid as – as the fighter cancellation by Duncan Sandys, same sort of thing. Er, so we’ve handed it all over, satellite launching, to Europe, principally the French with their Ariane series of rockets, which are very good, I’m not decrying that at all. Erm, but they’re certainly not as cheap and cheerful as – as our Black Arrow for launching small satellites.

[43:10]

Anyway, erm, the sequel to it was that Maggie Thatcher had announced in Rome, this was quite a few years later, erm, that she was going to triple investment in space and – which would enable us to build satellite launchers and enable us to be involved in the
latest European rocket, which was Ariane 5. Er, we spent a lot of money investigating a big chunk of the upper stages of the Ariane 5 and – and won it, won the contract. But, Maggie obviously had second thoughts, and perhaps she made a mistake, and appointed Ken Clarke, who was then the chancellor, to look into whether she should spend three times – should triple the budget. And we had lunch with him and tried to persuade him that it was a good vehicle but inherent in the bit that was being investigated was a – the last stage as a re-entry piece. What’s it called?

_Shuttle_

A shuttle. And, er, the shuttle was called Hermes or Hermez and it was preposterously overweight and it wasn’t going to work but, erm, when Ken Clarke visited the Europeans they tried to persuade him that it was going to work and Ken Clarke was hearing from elsewhere, including from us, that the shuttle was overweight and wouldn’t work. And he – we tried to point out to him that Ariane 5 would still be a very good satellite launcher and it didn’t matter whether Hermes would work or not, er, but he wouldn’t – he wouldn’t hear of it, and we had a very pleasant lunch with him. He’s a nice guy but he was – he wouldn’t be convinced that Ariane 5 without the shuttle was a going concern. And so after we’d spent a couple of million or so on winning this contract, erm, we pulled out of this – our investment and so we couldn’t have – you know, you got out of the contract what you put in, er, and that would have come back as work, so it had – it wouldn’t have mattered whether she spent the three million, she’d have got it all back again in work and, er, you know, taxes and all that sort of thing. Silly, it’s really silly. Anyway, it was – it was cancelled and the contract was given to Dornier and then after I had retired, strangely enough, the manager director of Aerospace, Westland Aerospace at it was when I left, erm, bought the Dornier company. And the boss told me with considerable amusement, ’cause he’d been at the lunch with Ken Clarke –

_Who was that?_

That – er, Chris Gustar, an ex-apprentice of the firm. And, er, we had bought back the Ariane 5 bit, so to speak. But we did continue on from Black Arrow because we – we had made a very good job of the covers, the fairings, that covered the satellite,
erm, and had to part and fall away, and we’d made a good job of that, and they bought it for a rocket they were building called Diamant, Diamant B, so we – some of our technology went for that. And then a few years later we got involved with the Chevaline project and the – in that, erm, what they wanted in the – just the development of Chevaline was to develop a control system that controlled the weapon as it re-entered the earth, an actual control system for that, which was based on an American design, funnily enough by the Bell company, [laughs] so we’d gone round a circle there. But, erm, the – so we built a rocket called Falstaff for the Chevaline project, er, and we – I think we built twelve. And six were launched, highly successfully to prove this control system, which I assume it did, that that part of the development was top secret, and even I wasn’t cleared for top secret, I was only cleared for secret, so I didn’t have to know anything about that except we got it to the re-entry speed and six highly successful launches were done with no problems. And apart from this other parallel story, erm, that was the end of space for me.

[49:55]

But, oh dear, I went to a very small amount, a few, of the overall control meetings, erm, in London and, oh dear, they – the meetings were appalling, absolutely appalling. Everybody was going over what they’d achieved and what were the timescales and the programme and where were we on the programme, and oh, the meetings were so boring, I didn’t like them at all, I’ve never been to such boring meetings [laughs].

Meetings with whom?

Well, all the people involved in the Chevaline project, from the Ministry of Defence down, to all the companies that were making bits, everybody was together to monitor progress. But it was the way they were conducted, it was awful, don’t ask me exactly what, I just have this awful memory of, when can I go home, out of this awful stuff [laughs]. It had to be done, I mean it was a routine meeting, it had to be heard but there’s something about the way they did it, it was terrible, awful.

Was the Chevaline work particularly problematic at all or –?
It didn’t seem to be and as far as I know we’ve never heard of any problems have we? We just don’t hear about the project at all. As far as I know we’ve still got these Chevaline ballistic weapons all ready to – to fire out of silos as far as I know.

*I think they’re in museums now mainly.*

I don’t know, I have absolutely –

*Bits of them [laughs].*

I haven’t – I’ve lost it because it’s – it’s a highly secret project and you’re not supposed to know. But that’s – there you are, that’s my involvement in space matters.

*I’ve got a bunch of follow up questions based around that but shall we take a short break first ‘cause I’m melting at the moment?*

Oh, yes, try moving over to the smaller chair.

[End of Track 10]
Track 11

The Black Arrow so –

Right.

Someone who’s never seen one before –

Seen a Black Arrow?

Yeah. What does it look like? Can you describe it to me?

Well, the first stage contains that the main thrusts’ engines, eight of them in pairs, swivelling like I described to you of the Black Knight. You know, in pairs they – instead of one going like this or like that [demonstrates] –

Could you explain what like this or like that actually is, so swivelling from side to side?

There’s – the rocket engine is pivoted at the top where my knuckles are, er, in the sense that it can move like that [demonstrates]. Now if they went – if this pair went

So if they both pointed the same way –

Yes, that would cause the base of the rocket to go this way and the top to obviously go slightly the other way, so you’d fire it over that way [demonstrates], or both the other way or they’d go differentially like that which would make the rocket twist. And then you’ve got another pair at right angles to that here, where, they can go like that or like that or like that, so that you’ve got an almost infinite possibility of control. Now in the Black Arrow we doubled it so they were in pairs, so this pair would go like that – sorry, or like that or like that, er, in pairs.

So you’ve got four pairs of rockets –
Yes.

_On the bottom basically._

Yes, double, and that’s more than double the thrust of Black Knight. That’s the first stage, and above that are six and a half feet, two metres, diameter is a high test peroxide tank, er, just a cylinder – excuse me – and above that is a small kerosene tank and then a slightly smaller diameter with four engines instead of eight, I think, is this smaller diameter second stage, same rocket engines. And then on top of that is a third stage which is solid fuel motor. That weighs somewhere around forty pounds – 40,000 pounds, the total thrust of the first stage is about 50,000. So you light the first – the first stage engines, you’ll fire it off, erm, when that firing has finished the – that first stage is discarded by explosive bolts and springs or – or little rockets, sometimes one, sometimes the other is used. Erm, and then you fire up the second stage and faster still, then you discard the second stage and fire up the solid fuel third stage until you’ve got to a velocity of something like 16,000 feet per second, and then you’ve reached the speed at which the satellite can remain in orbit. So you discard it and discard the, erm – you don’t discard the payload, you discard the solid fuel third stage, which has burnt out. Does that describe it for you?

_Hmm. What does it look like from the outside?_

What?

_Can you describe how it works?_

Erm …

_You know, bearing in mind that somebody may not have access to a picture of it, it’s just –_
No, I’m just going to have a quick look to see how – well, it’s just a cylinder and a smaller cylinder on top of that, and a smaller cylinder on top of that, that’s really all there is to it.

*It sounds fairly simple.*

Well, in principle it is. The big thing is to – to make it reliable and everything to work, and you’ve got an electronic control system, you’ve got… all the various, er, little jacks and things to rotate the rockets, all sorts of other control systems in the terrific vibration environment that’s created by the – by the rockets. And then you’ve got to cope with, erm, the heat that’s generated before the rocket gets out of the atmosphere. And then when it’s out of the atmosphere it’s bloody cold and you’ve got to cope with that as well.

[05:50]

And the whole thing in – with that vibration environment and temperature environment has got to be reliable, and that’s the trick, that’s hard.

*How do you make it reliable?*

Yes.

*How do you make it reliable?*

Well, no, experience and rigorous testing of all the components, which was done at our test facility. You have to do it at temperature as well, you see, it’s not just – it’s not just check for vibration environment, it’s check – check it in the temperature and at high temperature and low temperature, and that’s hard, it’s quite hard.

*So all these sort of testing facilities you were talking about, were they all based in site, on site at Saunders – I keep calling it Saunders-Roe but at –*

It’s all right, so do we [both laugh].
Do you ever stop thinking of it as Saunders-Roe?

No, not really [laughs]. There she is and that is something like forty feet, and this is something like six and a half.

Forty feet tall by six and a half across.

Yes.

Yeah.

So it’s just a straight cylinder tapering off to a smaller cylinder then a – it’s a smaller cylinder still underneath – underneath that fairing.

At the top.

And that’s got to be clever to deploy and not damage the vehicle and fall away properly but then I – during the course of one of the trials I had a telex from our manager in Australia to say we had now explored space from five eighths of an inch to, erm, 200 miles because a launch had to be aborted, and at the bottom inside there, to hold the craft together is a claw and a ball, and the claw is opened and the whole rocket is resting on the ball when the rockets are fired and it has to be quick before the rocket topples over to fire – so it’s not – it’s not released until the rockets are firing properly. And, er, in one instance apparently something happened and the – the craft had just taken off and everything shut down and the rockets settled back, and dear oh dear, it could have been a disaster but it wasn’t [laughs].

[09:10]

How does one actually develop a rocket, where do you start?

Well, the rocket engine itself wasn’t developed by us, none of them, those were – Westcott and places like that. You’d have to ask them that question but that is a
matter of test, test, test, test, because you’ve got to get materials right that can stand the high temperature in the cone, the exit cone of the rocket, and so on. Erm, and our – our difficulty was you can design an electronic system that does the control for you, which is a fairly straightforward thing, as I’ve said to you the – the big problem is how to get it reliable, what materials to make it of, what little joints, soldered joints, it’s all down to the real – every little detail must be tested and designed in such a way that it’s going to last for a hell of a lot of vibrations and not fall apart, and that’s the problem.

Do you have to be careful with producing them as well at the end or –?

Oh yes, oh yes, very high, er, inspection standards had to be introduced and it’s got – sometimes you’ve got to build it in the right atmosphere, erm, you know, do the, say … welding for instance, perhaps you do that in a nitrogen atmosphere maybe. I’m not saying that’s what we did, I’m saying that’s the sort of thing you – you’ve got to do because it’s got to withstand this huge variation of temperature, which is making all the bits and pieces expand and contract, so they’ve got to be able to do that without cracking up. And then at the same time as you’re doing that you’re vibrating them like mad, so that if there was any start of a crack it would very soon be spread.

Was it a more challenging project than the earlier ones?

What, Black Knight?

No, Black Arrow compared to –

Compared with Black Knight?

Well, actually yeah, compared with Black Knight.

Erm, it was slightly hotter, not really colder. No, not really, er, the same sort of environment. Bigger loads of course, erm, no, it was really a fairly straightforward expansion of the – of the Black Knight programme.
How did developing a rocket compare to developing a hovercraft as an engineering task?

Not really very different, ‘cause the hovercraft, you had a huge vibration from the fans and the propeller and, er, the addition of spraying salt all over the craft, having to stop that getting into the engines. Similar really, not the extremes of temperature, that’s the only real difference.

What were the funding arrangements like on Black Arrow?

You never were – you were paid three months in arrears and you were never sure whether you were going to get the programme stopped, which in fact happened in the end, so you got used to the fact that you did get paid at the end of three months [laughs] until it didn’t [laughs]. But then it got – to me it was a bit of a surprise, I never thought they would cancel it, I didn’t see the point of it, the cost was so minimal really. Er, and the technology advantages you got from it, you could supply America – the Americans with things and, er, it was silly really to cancel it, it was – they saved peanuts if anything. By the time you took everything into account I doubt if – if I’d done the accounting I’m sure I could have done it in such a way that showed it paid for itself.

Paid for itself in terms of extra technology spin-offs you mean?

Well, when you – when you were selling a satellite to do a job I mean we – Prospero was an experimental one, so we hadn’t reached the point where we were selling anything apart from the company product to the ministry. Er, but we could have been launching satellites for people, for European scientific establishments or American ones or – there weren’t that many satellite launchers about. I’m sure it would have paid for itself if it’d gone – if we’d gone on but no, rely on the Ariane 5, which wasn’t going to work [laughs]. Sorry, that was a bit sarcastic wasn’t it? [Laughs] – Kenneth Clarke said. I quite enjoyed talking to him actually but, erm, very difficult to get – get an answer out of him, very – very coy sort of, er, bloke, a real politician.

Were you having to tell the politicians in the Black Knight days as well?
Yes, that’s right, not nearly so much, nothing like that a minister of state like that, didn’t meet that sort of person.

[16:20]

What sort of people did you meet?

Oh, it was mainly from RAE Farnborough, I didn’t meet two many politicians, only ones who wanted to know what was going on, that was – that was – and of course the Isle of Wight MP always wanted to know what was going on, and rightly so.

What’s your contact like with the RAE over the building of Black Arrow?

Very good indeed, very good relationship we had with the RAE, at all levels.

How does it actually work?

Well, you have progress meetings. Er, I can remember the chap who was in – in charge of the Black Arrow project, I can’t for the life of me remember his name, I can see him. But he got an obsession about this bloody package that carries the – this expensive vehicle to Australia, it’s ‘The cost of it is absurd,’ and we’d say, yes, but it’s got to be air conditioned, it’s got to be protected and this kind of – and this and the next thing, ‘All these things cost money,’ oh dear [laughs]. But that was – we’d go outside the meeting and it was all amicable. Erm, but he had to have his little say about this expensive package to convey the craft to Australia. It was a big thing, fifty feet long and six and a half feet in diameter, and heavy, and it wasn’t full of fuel of course. Erm, and having to be monitored for temperature, temperature controlled, and not being vibrated too much was quite a package really but he didn’t like the cost of it, which was fair enough, he was the customer [laughs].

Did you ever notice any differences in approach between government scientists and commercial scientists and engineers like yourself?
No, they were a good lot at Farnborough, very – very good lot.

Not so much in terms of quality as in terms of, you know, different approaches to problems and –

No, not so much. We’d been working with them for such a long time that we’d got to know one another, and there weren’t any problems at all. If they asked – wanted to know something, they just asked the question and we told them the answer, we didn’t try to hide anything or be – we weren’t in competition with anybody. Had we been in competition with somebody, direct competition that they were making a Black Knight and we had to make ours better and cheaper than theirs, if it had been that situation with Farnborough in the middle that might have been different, but it wasn’t like that. It was we’re – between us we’re making this thing and we want to make it work together.

[19:40]

Did you ever think about –? Did you ever get patriotic about helping something like Black Knight and Black Arrow?

One or two of us did, I didn’t, I didn’t feel that at all. I just wanted it to work and do its job, and we must do everything to make sure it damn well does. And that was my obsession, if you like, I didn’t care whether – who it was for, I never even thought about that aspect of it, unless somebody brought it up. If somebody in the States wanted to, which they didn’t, but to sort of downgrade us, I wouldn’t have that but that never happened either. As I said to you right at the beginning of this, engineers talk to one another and they’re not bound by, erm, the competition between nations, they just want to – any engineer just wants to get on with the job and make it work.

[20:57]

Would I be right in saying that in the sort of mid-’60s onwards the two biggest jobs you’ve got are Black Arrow on one side and the hovercraft development on the other?
Yes, and lots of other little jobs along the way.

*Such as?*

Well, the last one I had was interesting. I was asked by Basil Blackwell, the chief executive of the Westland board at the time, to take over the development of a helicopter, erm, unmanned helicopter, to spy out for artillery fifty miles away, a highly secret project and we had a little – little team of some from Yeovil and a few from Cowes because in Cowes we were – we designed radio controlled models, free flying and, erm, hovercraft, free flying thing. So we were quite used to designing and this little team was to put in a proposal for this big, er, change, I think – what was it called? [Pause] I’ve got Prospero in my head and I can’t get it out. Here we are, it was [pause]. Oh, they haven’t put the name of it.

*Page 128?*

Yes. [pause] Phoenix, that’s what it was called. Oh, they haven’t used it in the text either, 127.

*And that work was done in early 1980s?*

Yes. And, er, we – it was, I think, preordained that the answer was going to be an aircraft and that although there were big advantages of the helicopter version, especially in retrieval and able to land it vertically instead of zooming in horizontally, erm, but as it happened the very experienced people at flight refuelling got the job but the ministry approached me to say that if we would continue the development of the helicopter version they would find a way of funding it, hmmm, because we’d put such a good case. And, er, but the – the board below Basil decided they needed these engineers, erm, on the big Merlin helicopter for the Ministry of Defence, so I didn’t have any staff so that was – that was the end of that. But I believe we would have sold that to the ministry in the end.

[26:05]
Can I ask you one or two other quick questions, just relating to your own work on Black Arrow?

Hmm.

As chief designer what do you have to do on a project like that?

In a project like that I had to just make sure that – first of all that they had adequate, erm, numbers and quality of staff to do the job and that somebody was in charge under me of it.

Who was that?

And that was a chap called Cliff Maidment, also ex-Imperial College aeronautics department. And, er, worked very well indeed, very well indeed. And you had to have somebody in charge of the High Down establishment and some – somebody in charge of our Australian part of the exercise, Jack Redpath was his name. And, er, having done that you just, er, kept an eye on things because there was only developing the technology of – technology of Black Knight, scaling it up a bit, not always necessary. A lot of the control system didn’t involve force, so it involved electronics, and that didn’t have to be upgraded, that could be – in fact we used – that Black Knight electronics part of the control system, we used on SRN4 ‘cause that had a control system for the – for the incidence of the propellers and for the angle of the pylon on which the propellers were mounted. Erm, and that was in principle the same thing as Black Knight. In fact that was so reliable that the chief engineer of Hoverlloyd said to me once, ‘We haven’t got any spare parts for these controls of these pylons.’ I said, ‘Yes, you have, the whole system is built in with spares into the back of the control cabin.’ Oh, no, no, no, he said, he was a Welshman, not that there’s any reason for saying that, he just was a Welshman. And he – I said, ‘Come with me’ so I took him out to the craft upstairs. I said, ‘In there’ and he opened it up and there they were, the spare – the spare control electronics, which had never been used, and to the best of my knowledge never was, ‘cause it was – it had been so comprehensively tested in a worse environment than it was in on the N4. So there are all sorts of reasons for – for not changing the design team more than I possibly could
to make sure there was continuity. And I didn’t actually do any actual design on – on Black Arrow.

_Did you have to have meetings with government ministers at all?_

Oh, yes, yes, not government ministers but government officials, oh yes. I wish I could remember the name of the chap who ran the monthly meetings.

_Was that with the RAE chap again?_

Yes.

_As the project progressed did you foresee a glittering future for it or –?_

Oh, we thought that having – mind you we only had a day or two to think about it but after the success, you know, where we go from here. But we knew we could develop, erm, Black Arrow again, the whole principle was – could easily have been expanded with bigger payloads but Maggie had pulled the plug because you could only get back into your country how much you put into the ESA establishment.

_Yeah, with the later Ariane work._

Yes. And you could only get out as much financial, er, cost as the government had put in, it was the way ESA worked.

_[31:30]_

_When did you find out that Black Arrow had actually been a success?_

Oh, I had a telex from Australia, from Jack Redpath who was in charge out there –

_Do you remember what it said?_
On the Friday. Er, something, I’m very pleased to inform you that there’s been a highly successful launch of the Prospero satellite into a near perfect order – orbit. So that’s enough what it said. It was on a Friday, I remember it vividly, I went home sky high, I was ten feet tall [laughs]. But there you are, and down to earth on Monday, well, that’s life.

What actually happened on the Monday exactly?

Oh, just that I went to our routine board meeting which was about ten o’clock and, er – or even eleven o’clock, I can’t remember exactly, or maybe half past ten, I don’t know. And, er, it was reported by me that it was a very successful launch and the boss said, ‘I’m sorry Ray, the contract’s cancelled and you’ve got to go and tell your guys that half of them have not got a job ‘cause we haven’t got any job to give them.’ So that’s what I went and did. I remember one of them had been fifteen years out at Hightown and – and I’d been at school with him and lived almost next door to him as ten year old kids, grown up with him, we were friends as boys, and we’d lost it along the way of course but – ‘cause we’d moved away from Parkhurst, so probably had he. Erm, but he came up to me and he said, ‘You can’t dismiss me, Ray, just because you can’t find any work. You’ve got to find some work,’ and I said, ‘we are trying,’ Jack his name was. ‘We are trying Jack, but we haven’t got it and we just can’t pay you for not doing anything.’ He turned round and walked off, a bit distressing. But there we are, that’s what it had to be.

Was there ever any talk afterwards about regenerating the space business?

Oh, yes, there was even ten years afterwards, why don’t we resurrect Black Arrow and upgrade it? But, you see, I should think Ariane 5 could launch five or six satellites that size all at once, but expensively, that’s the – that’s the other side of the question.

What was good about Black Arrow as a design, do you think?
It was very cost effective, very cost effective, both to design and produce, it really was, and that was said in public by – the senior official at Farnborough said publicly what an efficient job it was.

**Why do you think it was cancelled?**

‘Cause they didn’t want anything to do with satellite launchers, they wanted to put – they, the government, wanted to put all their money into satellites themselves, develop satellites for various jobs, which they’re doing very successfully, and you can’t argue about that.

**And do you think it was a mistake?**

A mistake? Well, yes, I personally think it was a mistake, but it wasn’t a very big mistake, erm, because Ariane 5 has been very successful, there’s no getting away from it. Erm, if Ariane 5 had lots of failures, which were being forecast in some circles, which could have happened, er, then they would have made a mistake but no, you couldn’t say that. You could say it in the sense that it was bad for Britain ‘cause we – you know, it would have provided work for people, Black Arrow would have, which would have paid for itself, so in that sense it was a mistake.

**Hmm. I know spent a lot of time talking about the projects you’ve been involved in over the ’60s and ’70s and I was wondering how your career moved on from chief designer.**

Er, well, that went on until – erm, now this is where we might want to say something about keep – keep it quiet for a bit.

**Do you want to just –? Let me know when you get to that point –**

Now.

**And I will – now? Do you want to pause and just quick chat about –?**
Yes.

*Right. I'll come back with a question if it's all right [break in recording]. You got made chief designer in 1966, what was the next step on your actual career path?*

Oh, well, it was when Dick Stanton-Jones was made full – after he’d been made full managing director, er, and decided in 1972 that he couldn’t continue as technical director that I was appointed to take his place and was told they wanted me to retain my position as chief designer, which of course I was delighted to do. I had no worries about doing both jobs.

*What’s a technical director do?*

Well, he’s directly a part of the board, so he is responsible to the board for all the activities, er, technical in the company and the cost of them and all the other implications of the technical matters to the good of the company, the whole company, whereas the chief designer is responsible for the design.

*Right. As a technical director did you also sit on the board of, was it Westland by this point or –?*

No, it was British Hovercraft Corporation, yes.

*What actually happens at a board meeting?*

Well, you discuss the progress of all the projects that are going on and how much they’re costing and the – are they making a profit and all that sort of thing. Are there any legal problems and, oh, erm, things like patents, all sorts of legal matters. It’s quite a comprehensive thing.

[40:20]

*Any of your work at Saunders-Roe been patented?*
Oh, yes, yes, I’ve got a few patents and they’re listed in the book but I can’t remember how many there – there were quite a few –

*On what sort of things?*

A dozen. They were mainly on the hovercraft skirts because we had the job of making them work, and believe you me that was a horrendous job. I mean the first one last – the first skirts lasted a few minutes, and making them last was the – and making them work in such a way that there was the most comfortable ride of the craft and that they’d achieve a best performance, and so we were continually developing the skirt’s context, and its structure and integrity.

*Why is it so difficult to get a skirt working properly?*

‘Cause it vibrated so much and you had to use flexible materials that weren’t used to the wet and salty environment and being wobbled about all the time. And we – we ended up testing materials by making a specimen about, er, a foot to eighteen inches wide and just a little bit longer, and holding one end of it and blasting air at something like a couple of hundred feet per second over it so the ends were flapping violently. And we established a time limit that that should – the material should be able to withstand before it started to fall to bits. And that – that caused quite a rapid development in the integrity of the material of the skirts, and especially what we called the fingers of the bottom, that formed the flexible bottom of the skirt.

[42:40]

*Are there any other advances in sort of hovercraft technology over the period from, I guess, the mid-’60s to the early 1980s?*

Well, er, the – the idea of automatic welding of marine standard aluminium alloys instead of aircraft, erm, aluminium alloys which would – which had a tendency to corrosion. We managed to find ways of abating that but marine standard would have been better, but it was lower strength and so we found a company in Germany that made big wide, extruded – so you had a sheet and its stiffening all in one piece, and
then automatically welded the sheets together and we extended that to making big extrusions as a beam across the width of the craft instead of a beam that had an extrusion at the top or a bent angle at the top and the bottom, and then riveted or glued together, and then stiffeners running up and down them. We went to a single extruded beam, all in its own right, and that was all my doing. Somehow or other the – the Yeovil patent people had allocated the patent on that to somebody else, which irritated me a bit, but it was partly my own fault ‘cause I said that they shouldn’t be automatically allocating patents to me, they should properly investigate it but they – in that particular case they never asked me and, er, the young man they allocated it to in the stress office eventually tried to tell them that it wasn’t him and they said in the end it’s got to be allocated to somebody, it’s you, so I am told.

[45:00]

_How do patents actually get taken out within a company?_

Well, the company has a patents department stationed at Yeovil, run by a fairly senior engineer.

_Do you see much of the company patent agents or –?_

Oh, yes, ‘cause that was part of the license agreements with – with Bell and the Americans and Japan, and the US navy, that was all part of that. The – the patents that you had was they had to have the use of them, and they paid for that.

_How did the arrangements with sort of, take Bell for instance, how did that get set up?_

Oh, it was a discussion between technical, legal and patents people. Er, and you paid the fees and you got a patent and then if you wanted to give other – others a use of that patent, again those same sort of people were involved in telling them what – what the patent offered and how much it would cost for them to use it and for how long and so on.
How were the tie ups set – how was the tie in originally set up with Bell? When did that actually happen, about?

Oh … it must have been somewhere around … 1960.

That early on?

Yes, a bit later maybe, yeah. Maybe two or three years later than that, I’m not sure, I wasn’t involved in it.

That’s just in relation to the hovercraft stuff?

Yes.

After you became technical director, I guess after the cancellation of Black Arrow, was your work mainly on hovercraft from that point or …?

Well, we had quite a lot of helicopter chunks which we designed for Yeovil like the whole cabin structure of the Merlin which had to withstand a heavy bird hitting the structure. Yes, it’s in there, erm, things like that. We had – still had contracts with companies like Bombardier to – that were continually being developed with engine developments and so on, and improvements and bigger aircraft and so on and so on, the usual sort of thing, we had all of those. I had that Phoenix project, erm … I was working quite hard with Christopher Cockerell on various things, like the wave power thing, so pretty busy [laughs].

[48:45]

What’s a typical day’s work like as a technical director and chief designer, how busy are you? Can you give me some flavour?

Well, mainly it was dealing with people all the time, making sure they were doing what they should be doing and that they were properly staffed and all that – all the intricacies of what the people needed to do their job and were they doing it, and if so
were they doing it on time, was it good enough. So I’d look over the design quickly and see if I thought it was all right, could I make a suggestion, which I often did. And that’s really – busy with people all day.

Do you ever find yourself solving little problems for other people as well in a technical sense or –?

Not very much, no, not very much. It’s mainly making sure that everything was going to time and all the rest of it. So much for all that detailed work that I’d done at university, that had gone out of the window long since [laughs].

But had it gone out of the window just for you or for everybody else as well?

Oh no, no, there were – there were other people who had to do the sort of work that we were taught, oh yes.

But, you know, are they using new tools?

Oh, computers. I began by establishing a full link to the big computer down at Yeovil into the design department so we could do work for Yeovil directly through the link. And we’d – this board and set square and so on, all that had disappeared, it was all either on a big board with a – with the square at the proper angle that was on an arm that you could put – move and turn, or directly onto the computer.

But does the big board actually feed information into the computer then from the drawing?

No.

Okay.

No, erm, what the comp – from the computer you produced a drawing, from the board you produced a drawing, they were separate, but both ended up producing a drawing [laughs].
How much difference did computers actually make, do you think, with the work that was happening?

It was faster, oh yes, definitely faster, no doubt about that, and the cost of design went down quite significantly, no doubt about that. And nowadays you – certainly in our firm you don’t see a drawing board, not in the design department. Whether you see it somewhere else in the works, you possibly do, but as a general rule it’s all done on the computer.

Right. Are there extra people involved? Did the skills involved in actually stressing something change then with the computer involvement or –?

No, not the stressing, no, no.

What about –?

No, it was just the same.

What about other jobs?

What do you mean by other jobs?

Let’s take aerodynamics or something for instance. Were there different skills involved with this new computer for it as opposed to –?

No, more or less you’re doing on a computer what you’d do with that slide rule I showed you.

Can we take a short break?

Hmm.

[End of Track 11]
Track 12

Go from there, okay.

Okay.

Did you find any other uses for hovercraft technology apart from –?

Yeah, there was – there was – I would say three. The first one was a small hovercraft. We used to make little rubber pads that you could put under a platform and inflate, and the air would escape under the – under the rubber pad. And you could wheel quite heavy loads, a ton and more depending on how many of these pads you used, you could wheel things about the factory with hardly any effort, and we sold lots of those, erm, in the ‘70s. Why we haven’t sold any I really don’t know ‘cause they weren’t expensive and they were very easy to use. The second one I can think of is for the CEBG we – and this was started by the Vickers group –

CEBG?

Central electricity generating board, erm – sorry, I was doing what I was complaining about [laughs]. Er, to convey or take part load [pause]. Take big transformer loads, for instance, over – there’s lots and lots of weak bridges in this country over roads where they would want to take these heavy transformers, so we built this big machine with an air cushion underneath it to relieve the loads enough for these big loads to go over bridges. And we – Vickers built [telephone interruption].

Talking about weak bridges.

Yes, all right, I’m with it. The Vickers team was under a chief designer called Alan Bingham, who in the early days of British Hovercraft Corporation was responsible to me for a short time till he found something else to do, I think it was with Vosper Thornycroft. Anyway, it was taken – the transporter was taken over by the British Hovercraft Corporation and it was operated and maintained by us. Er, somewhere around 1990 we were still doing it and – but I believe that now the Central Electricity
Generating Board operates it under their own auspices, so that was a second application. A third application was big … hover barges, erm, to transport big loads, and some of these were made by a company of Gordon Macace and we took them over but after that, in spite of many attempts and many contracts designing them, including a big contract for an American company called Sohio who in fact bought SRN4 fans to generate the air cushion under a big hover barge many tons in fact. One proposal we had was to have two of them and a drilling platform suspended between the two, and that went a long way but somehow or other they never came to fruition for various reasons, including Sizewell B. We had actually got a long way down the road with transporting these big components into the Sizewell B place but then the board changed and all the people who were pro the project retired and the new ones decided to do it a different way. But that was another big application that was explored many times and always found to be feasible but somehow or other the money or the projects didn’t materialise.

[05:00]

Do you think hovercraft technology has actually been exploited to its full potential yet?

Erm, pretty well I would think but I would think that in the future this business of reducing friction under – under these big loads and ships and what have you, it’ll come again in a different form but it’ll come again, for sure. And the amphibious part of it, that’ll remain and that’ll go on and expand as it is, all over the world that’s being used now. And as soon as you hear of these floods in Pakistan and places like that, I mean there you go, how good hovercraft would be, amphibious ones, in areas like that. And there is the odd one there but not – not enough to make a significant difference but there is – it is there and it’ll happen I’m sure.

Where do the ideas for these other applications of hovercraft technology actually come from?

Oh, they came from the customers usually, you know, can you do this, can we do a big hovercraft because towing things over – for instance, the north slope of Alaska,
towing something over that is no joke for all sorts of reasons, including marshiness. It has been found by flying SRN6s over things like birds’ nests that it doesn’t damage the eggs or the nest, just leaves them completely as they were, so it’s environmentally good for these areas where in fact the environment is – preserving it is very important. So it’s going to happen, they’ll continue and it will develop, as soon as these areas want to be developed. There isn’t really another way of doing it.

[07:30]

One of the other possibilities I was going to ask you as well was mine sweeping hovercraft.

Oh, gosh, that has been proved time and again by the navies. The only problem that you have with them is, erm, that the crew don’t need to live on board and so if you’re developing a navy and you’re changing the staff over you train them from small vessels to big vessels and hovercraft aren’t suitable for that sort of [telephone rings]. It’s all right, Jean’s taking it, she’s got two telephones there now. Erm, the hovercraft isn’t a vessel that you would just sleep on – with it more, there’s just no point in it. It’s so easy to take ashore, that’s what you do, and so that aspect of the use of ship as against hovercraft – ships, I got myself tied up there [laughs]. Minesweeping hunter ships, MCM ships, erm, have this advantage that you can train people to be naval men on them as well as do the MCM job, but us in conjunction with the Royal Navy have proved time and again how effective a hovercraft is in all weathers of doing mine hunting and destroying. And the big plus was the – when they’d finished their use of the SRN3 the navy decided to sink it and they exploded 2,000 ton mines, 2,000 tons? Yes. That sounds awfully big, I’m wondering if it’s 2,000 pounds.

Probably 2,000 pounds.

It’s 2,000 something.

2,000 tons is about the yield of a small nuclear explosion I think [laughs].
Yeah, it must be 2,000 pounds, erm, a bomb. And what they wanted to do, they got it right up almost underneath the side of the SRN1 in a series of explosions and the idea was to roll the craft over and break it in half, and it did neither. They had also put things like ordinary valved television sets on board just to record what happened, and they weren’t damaged, and the craft sailed merrily back to port with minor damage to the trailing edges of the fan blades, and that’s all. So, er – and that funnily enough – completely by surprise an SRN4 was travelling down to Dover and had some minor problem with the hydraulics on the control system on one of the propeller pylons, and so they pulled ashore, about halfway to Dover, to repair whatever was gone wrong and put more oil in and so on, the usual maintenance thing. And when they backed the craft off the beach they found that they’d exposed a German World War Two mine right underneath the craft and gone over the top of it and not exploded it. So whether it would have exploded, whether it was still capable of is another matter, but nevertheless they had not exploded it, so that is another well proven MCM part of it. But the – we did a trial. We took the naval BH7 and equipped it with all their top class mine hunting equipment, navigation equipment and recording equipment, and operated it at Portland, off Portland, in their trials area and in quite a variety of weathers in midwinter, and it proved that the job could be done. And we were given a contract to design a slightly bigger version of the BH7, a stretched version for the navy, and we were, I don’t know, three quarters of the way through it when, lo and behold, another defence cut. And that was peanuts and had had we the Omani contract I think that wouldn’t have happened and I had a very apologetic letter from the commodore in charge of admiralty procurement, apologising personally to me ‘cause I’d tried so hard, er, to get it all done that they were cancelling it. But they – they felt that the money wasn’t justified, so cancel the contract they did.

[13:33]

How closely do you work with the navy on something like that? Do they sort of just tell you what to do or are they there as –?

Oh, no, no, they’ve got – they’ve got the Royal Corps of Naval Constructors who are the designer of the navy ships and you work directly with them. And this chap, David Brown, was one of the people that we worked very closely with and I got very
friendly with. He’s – he died recently, so he’s no longer with us, a noted navy historian.

*DK Brown?*

DK Brown, yeah. Now he – he is an engineer, a navy design engineer, was sorry.

*So on something like a – so working to develop that mine sweeping hovercraft with the Royal –?*

Corps of Naval Constructors.

*Thank you very much [both laugh]. I was trying to remember what the acronym was in my head.*

I didn’t use an acronym, I was very good.

*That’s probably what confused me [laughs].*

Oh, you mean I should have. Oh, well.

*With the Royal Corps of Naval Constructors, you know, was he sort of remotely based or working down here with you or –?*

Oh, no, we went to them, they – I presume they still do, er, operated from Bath, or nearby Bath, and we would go down there. And there was also the underwater research establishment at Portland which no longer exists now, that’s all been cut, as the current word is.

*What sort of information are you passing from side to side?*

What do you mean, what –?
Well, what sort of information are you getting from the naval constructors and what sort of information are you giving to them?

Oh, that’s – well, we – this would be at a senior level like my level and we – all the discussions would be at my level and passed down the chain at each end, that’s how it would work. And you would show drawings and what have you, and discuss it and each would go back and think and discuss it again and so on.

*Something that happens the whole way through the development of the hovercraft then or –?*

Well, when we were talking about something for the Royal Navy, yes.

*Right, okay.*

Yes.

[16:20]

*I think we’ve touched on a few little issues here but I was wondering if you could give me an overview of the other activities you were involved in over the 1980s.*

What, you’re thinking outside of work are you?

*I’m thinking inside of work and that we’ve touched on a couple of bits and pieces but –*

Well, there was that little, er, helicopter, automatically controlled helicopter. We were responsible for the control cabin of the big Merlin helicopter, and that was a really hard design because that cabin has to withstand the impact of a heavy bird at sort of 100 knots plus speed, and that had to be tested with the actual body of a bird, you know, a dead body of a bird and you – you’d throw it at the structure [laughs] and make sure – the structure has to stand the impact.
Forgive my morbid curiosity [laughs] but how do you get a bird up to 100 knots?

Er, well, there is a special facility for doing this. I think they had it at Yeovil, I’m not sure about that, it might have been a government establishment that did it, I think it probably was. Er, I didn’t actually see the test itself but I’m pretty sure it was a real frozen bird that was fired at it, yeah. I don’t think it was a simulated bird. Anyway, it was quite a heavy object to go heaving at a light aircraft structure.

You mentioned Yeovil there a second ago and I’m aware that’s the other big Westland site isn’t it? How much sort of contact is there between the two of you?

Er, well, if we are doing a part of a design for them obviously there is straight cont – direct contact going both ways and progress meetings are held with – we go there and, er, they come here to look at the design and – but, er, we here have our own design approval so they don’t have to supervise it down to too much detail. We produce the drawings and sign them, approve them and what have you, and they – the end result is those drawings are sent down to Yeovil or to our factory depending on which is which. But the approval rests here, ultimately, and the responsibility of course, and – which we have to maintain to the satisfaction of government departments. We have to be approved.

Did you have to make any other trips for work in the 1980s of note?

Erm … no not – there was the Oman contract which I’ve spoken about.

You haven’t mentioned it on – we haven’t done that bit yet.

Yeah, we haven’t talked about that yet have we?

No. Would you like to talk about it now or …?

Yes, the – well, let’s jump –
Or shall we start the story at the beginning with the –? Pop that on pause, okay [pause]. Did the way the company was organised change at all in the 1980s?

Yes, it did because the – the group chief executive, Basil Blackwell, Blackwell, decided to introduce a new comprehensive matrix organisation into the group under a new company which he called Westland Helicopters and Hovercraft Limited. And the British Hovercraft Corporation, er, was put on the shelf but it was a – in my personal view, crazy, because for instance in my own position I was made hovercraft business manager and told that that was equivalent to me being managing director of hovercraft. And – but the only staff I had were the salesmen who were working for British Hovercraft Corporation; I had no estimators of cost, no designers, nothing. The design team, there was to be one design team with one design business manager and he was responsible for both the Yeovil teams and the Cowes teams, and so it went on and it ended up with every department at Cowes was responsible to its opposite number at Yeovil. And I referred to this as eighty management strings, eighty miles long. Erm, and that’s very sarcastic I know but that’s how I felt about it, that it was just stupid. And when I convinced an Omani admiral, who was British, that hovercraft mine catcher vehicles were the bees’ knees, erm, we went out to Oman and I gave a presentation on the technicalities of it and what the hovercraft could do and how it could be easily converted to other uses. Erm, and then it was handed over to the business business group, who did the estimates and presented the admiral with the costs of the project. And he was appalled at the – at the cost and said so, and they said, well, it was open to negotiation and he said he didn’t want to negotiate a contract, he wanted the contract with the minimum profit to Westland, not trying to make sure that it was too small but the minimum reasonable profit and that’s what he should have been quoted. And he said since they hadn’t done that would we please all go home, and we were sent away. And that was the precursor to the navy pulling out of their contract that they had with us for mine counter measures craft. Had we – had that not happened I think we would still be designing and building MCM hovercraft.

[24:20]
Anyway, erm, it wasn’t going to last and it lasted – it lasted two years, which I thought was pretty good, and then the company went bust. They had, erm, had a strange contract for civil helicopters which the chief executive was very keen to get into passenger carrying helicopters and they took on a contract that was very dangerous which – with a helicopter that Dick Stanton-Jones and I thought was underpowered, which it turned out to be.

*Which helicopter?*

Erm, it was … if you like, a stretched Lynx, I can’t remember the number of it, I don’t know that it ever got a name. I don’t know, that – that escapes me for the moment, but it was operating out of an airfield in Los Angeles and when it was very hot it just wasn’t capable of carrying the full payload. And I was sent out to, er, see what was going on and everybody there was telling me that the helicopter was no good and that they were having to keep on introducing an aircraft, a small passenger carrying aircraft, to keep the service going. And I reported that back and heard no more until the company went bust and with debts of 100 million.

*What was wrong with the helicopter?*

It was under – it was underpowered and so, er, it was a perfectly good helicopter in ordinary climates. As soon it was operated from a hot and high place the power wasn’t enough. It seems very easy for me sitting at – all these miles away to criticise my colleagues at Yeovil but I think they were talked into this operation to get into the passenger carrying field and I think – well, it was a bad mistake, it broke the company. Whether I’m right or not about it being underpowered, the service was called off and all the usual penalties were imposed and the company went bust. That’s my view of what happened and, er, one of the – the heli – the director at Yeovil, David Holt was actioned to produce a paper to the board as to what to do with what they called Cowes, which meant what used to be British Hovercraft Corporation. And he said it should be reformed in its own right as a new company and I was actioned to help him write the paper with my knowledge of what Cowes could do and what we were capable of in other words, and so I contributed to this paper and it went through the board and Westland Aerospace Limited was formed with its own board
and in its own right. And, er, I was made business development director of it to find new work, which I tried very hard to do. And Heseltine was involved in all this, it’s part of what was called the Westland affair, and, er … Sir John Cuckney was involved in finding somebody to refinance the group and he found what I think of as Sikorsky but United Technologies or something was its – the title of the whole group and they, and I think it was Fiat, contributed a bit to buy out the firm. And, er, Westland Aerospace was set up and unfortunately Heseltine lost his job.

[29:30]

What happened?

Erm –

How did Heseltine lose his job?

Well, because he didn’t want America involved, he thought that Europe should – we should find partners in Europe and not America. And Cuckney wasn’t persuaded and so Heseltine didn’t get what he wanted and it wasn’t long before he was – I think he was sacked wasn’t he?

I’m not sure if he was –

I think so. Well, anyway something happened to him and – but he didn’t get his way, that’s the point, whether he was sacked or not. As far as the media’s concerned he didn’t get his way. I was with him, I think it should have been Europe and of course it is now.

What was the view within the company at the time from your perspective?

Hope. Hope that the firm could be rescued and when Westland Aerospace was formed we were cock-a-hoop of course. We were back owned by ourselves and still – well, no – later on GKN bought Westland Aerospace and it’s now GAKN – GKN Aerospace, and it’s expanded quite a lot. I think the total number of employees of the
whole GKN Aerospace group is somewhere up around 6,000, hmmm, but British Hovercraft Corporation peaked at, I would think, about 2,500 I would say, so it’s gone very well indeed.

*At the time was there any particular feeling within your own part of the company about whether the company should be looking towards Europe or the United States?*

No, no specific – mine own personal opinion was I’d sooner see it Europe. I had no objection to Sikorsky, we were on very good terms with Sikorsky, and I had to go and visit them quite a bit to try and get a technical connection into Westland from – from the research establishment and various other places of United Technologies. And before that happened the – it was all fixed up and Westland Aerospace was fixed up.

*How did you feel about that at the time?*

Very well, I thought it was a good idea. It’s a pity that it wasn’t – I mean it could have – you could have renamed British – oh, crumbs, British Hovercraft Corporation could have been renamed Westland Aerospace, that’s more or less what happened so in effect we’ve recreated but – because there was a helicopter – a hovercraft division of Westland Aerospace.

*I hope you don’t mind me asking, how did Westland end up in such financial trouble in the first place? Was it just that one helicopter deal?*

Well, erm, we lost four million on the stretched N4 contracts with Hoverspeed, so we didn’t help but that’s a pretty minor part of 100 million.

*How much, sorry?*

Well, we had – I know that Westland had a guarantee of 100 million from all our properties and, er, I assume that had all – all been used up otherwise they wouldn’t have gone bust, that’s just – to me that’s obvious, I don’t know whether it’s really true and we went part of the way, I don’t know, but it went bust, there’s no doubt about
that and had to be rescued. So what else, I wasn’t well enough up with what other aspects had lost money, I don’t know.

[34:10]

What happened to your own job after the spin-off?

Oh, well, I was made development director of Westland Aerospace to help get work for – for the company, which I did, erm …

What sorts of jobs?

Well, erm, I – that business I was talking about earlier of Ariane 5 work, that was all when we were part – when we were Westland Aerospace, so that was one of the big things that we had – we thought won a big contract but, no, it wasn’t to be. But now, as I said, we’ve got it back now in effect but, er, I went into the whole idea of things and we bought a company called Marex which did a lot of, er, work on factory control systems, computer control systems, and amongst other things they installed a system in our own factory for us, erm, all sorts of things of that ilk and so on. My last job, er, ‘cause how long was I there? For six years I was there and my last job was a big new extension to the factory at what we call Falcon Yard which is up – a bit up river from our then main factory, erm, called Falcon Yard which used to be a shipyard. Er, and there was a big extension of that for building and testing, er, reinforced plastic, mainly carbon fibre, and a very big automatically measuring machine which could measure complex components with – little probes that had to be so accurate that we had to have a twelve foot cube of concrete to mount it on to make sure it was completely stable. And we put a new high pressure – excuse me, a new high pressure autoclave, sorry –

Do you want to pause for a second?

A big one, er, in – in the establishment. The big high pressure, high temperature, 400 degrees C and because you had that high temperature you had to have nitrogen purging [coughs] and so all that installation amounted to about five million pounds.
And when that was finished I – we were looking for work and we were making some people redundant and I felt that after 46 years and I was nearly 65, it was time for me to make way for somebody else and save a few jobs, so that’s what I did.

[38:30]

I resigned and I was given a very good farewell package and the managing director, Chris Gustar got the whole factory in the big hangar with the Union Jack to wave us goodbye. It was all very moving and one silly part of it was they decided one of my presents, one of my presents, was to be a bicycle. And they threw two parties for me, one with just the directors and then one in the canteen, and they presented me with this bicycle and made me ride it round inside and then I had to get it home and it – by that time it was dark and I rode it home, past the policeman’s house with no lights [laughs] oh, dear. I was a big past caring [laughs]. And that was the end of my – [coughs] sorry, this’ll go in a second, it’s slight asthma that I get from time to time. And my new life began.

That’s a pretty good place to hit the stop button I think [laughs].

Oh, gosh it’s –

[End of Track 12]
In your last decade or so at Westland were you never offered the chance to move anywhere else or work on anything different?

Yes, I was. Somewhere in the early ‘80s I was summoned to Yeovil and three senior directors interviewed me to offer me the job of, I think it was either project engineer or project director or something like that, of the EH101 Merlin helicopter, the big helicopter for the Ministry of Defence. They felt they needed somebody to coordinate it and, er, increase the – the level of cooperation with the Ministry of Defence, but I couldn’t get out of them what exactly I would be responsible for at Yeovil. And, er, they didn’t seem to understand where I was coming from, so I thought no, I don’t like this, this is one of those jobs that you’re not exactly sure where you are in an organisation, and so I turned it down in spite of the fact that they offered me a 10,000 pound a year rise, which in retrospect was a bit daft I suppose [laughs]. They reported back to the chief executive that I didn’t want to leave the Isle of Wight, which wasn’t true at all, I – that’s not – that was not the reason I turned down the job at all, but anyway I did. Looking back perhaps I ought to have taken my job and done my usual trick of making it what I wanted it to be, but anyway I turned it down. But, what they did do was several times ask me to take over little jobs as though I didn’t have enough work to do, which amused me more than somewhat [laughs] because I felt I had a lot more to do than most of the people at Yeovil with all the projects I was involved in. Anyway, I didn’t mind at all, it was – I quite enjoyed going down there. And when I retired quite a number of people I’d got to know down at Yeovil presented me with a signed and framed cartoon of, er – about me, I was very touched by that. And the patents department presented me with a bound copy of all my patents, so I obviously didn’t do badly in relation to my friends at Yeovil [laughs].

Do you think there was a different between the Yeovil part of Westland and the Saunders-Roe, former Saunders-Roe Isle of Wight part of Westland?

Yes, I think there was. We seemed to be more of an integrated establishment here at Cowes than they did down there. I think that – that almost goes back to Sam Saunders, that the way the company had been set up and run was established by him
and it remained a friendly, well coordinated place. People at Yeovil seemed to be a bit isolated, departments seemed to be a bit isolated. And maybe that’s just my impression but, er, they seemed to like to be in an isolated department, it’s very strange.

_Do you mean isolated from each other than –?_

Yes, yes.

_How did the situation compare at the Isle of Wight?_

Oh, here everybody talked to one another. Maybe they did there, maybe – maybe it was just the way they worked, I don’t know. It just had that feeling when you were down there that they didn’t work together as well as they should, but that may just be me [laughs].

[05:00]

_What’s the workload actually like as a company director, as technical director?_

Oh, the workload was very – very hard with so many, erm, projects and so many people to contact outside the company. It was quite time consuming perhaps I should say, I don’t – I didn’t find it hard, I got on very well with all the people that I had to contact, and so it – I didn’t find it hard but it clearly was [laughs].

_Any customers or clients outside the company you particularly liked or disliked dealing with?_

No, no I enjoyed meeting all of them. You just had to treat them slightly differently, erm, take account of who they were and what their responsibilities were. No, I didn’t have any real problem with anybody.

_What do you think were the best bits about being technical director?_
Oh, meeting people, oh no doubt about that. And not just your staff, the, erm – all the customers and authorities and what have you that you had to deal with. I enjoyed that, meeting people and travelling around. I went all over the world, I went round the world twice [laughs] and with my interest in geography you can imagine how much I relished that sort of thing.

*Any trips you particularly enjoyed?*

No, not particularly. Erm, it was always – at the end of the journey you were making you were meeting such friendly people. I don’t know if engineers are more friendly than other people or not but certainly I got on very well with people including – including people that were not engineers, and it was a very enjoyable experience. We combined that with the interest in the technical jobs, which I’d been well educated for, the whole – the whole thing was a most enjoyable time and I – I miss it but I’ve absorbed other things now, so I’m still enjoying life very much [laughs].

*Were there any, I don’t like using the words perks but, you know, privileges about being a company director?*

Well, I suppose the way I was treated on the island here as an important person, that was a pleasant experience, and being invited to be chairman of the governors of the college and things like that, which I enjoyed very much. Took up a lot of time but nevertheless it’s something you wouldn’t have been offered if you weren’t in that senior position in the biggest company on the island.

*What sort of other civic responsibilities were you offered?*

Oh, I was invited to be chairman of the young enterprise on the island, you know, where the senior students at the high schools had to form a company and sell some sort of product and hopefully make a profit. I was invited to do that, I was invited to be chairman of schools boards, erm, and invited to join the East Cowes branch of the RNLI and they were – I’m still involved in all those things. Not the college, I’ve – there were problems with if you were over seventy having to get the secretary of state’s approval to continue in post and when I got to seventy-four or seventy-five I
decided that I didn’t wish to do that any more, and I’d done what I thought was a good job at the college. But most of the other things, hockey club, the Isle of White hockey club, I had a lot to do with and I’m president of that still, so –

How much do you think that talking about these sorts of civic responsibilities alongside your actual job –?

Yes.

How much do you think that Saunders-Roe/Westland was part of the culture of Cowes and the Isle of Wight?

Er, not – not as much as perhaps it could be but I was encouraged to take these jobs by the board. There was no question of no, you haven’t got time and it’s going to distract or whatever, there was none of that, I was encouraged to do it. Erm, and I think the board felt that we should, the company should, be involved locally. Golly, the birds have gone mad [laughs].

[11:30]

As a company director as well did you get to use a directors’ dining room or any other –?

Oh, yes. Oh, yes, we had a very nice directors’ dining room for most of the time. Erm, by the time Westland Aerospace was formed we had abandoned the stables of Osborne House as a big design department and moved it back into the main factory down at East Cowes. Erm, so we didn’t – we abandoned our nice dining room with its big French windows opening onto a nice little patio with statues and things in it, er, we’d abandoned that ‘cause they – they wanted to put the rent up. The, er, crown properties people wanted to put the rent up and we said no, we weren’t going to put the rent up, goodbye [laughs] so – but I miss that dining room but that was many years I had the privilege.

What was the food like?
Excellent, excellent yes.

*Sort of a sit down multiple course meal or –?*

Pardon?

*What sort of food was it?*

Oh, erm, ordinary food but occasionally they’d treat us to a lobster perhaps and – but in the main it was quite ordinary food but it was all prepared in the kitchen adjacent to the dining room. And behind the directors’ dining room was the senior staff dining room where the heads of departments all got together every lunchtime.

*So all the directors actually meet every lunchtime as well?*

Yes, when they were there [laughs].

*Are there sort of business benefits for that as well?*

Oh, yes absolutely, oh yes, work was discussed, it was – I’m not saying it was discussed all the time but if there was a problem that was – that was raised and discussed, oh yes.

[14:10]

*Is there a difference between having an informal meeting there over lunch compared to something more formal in the company structure or –?*

Not really, no, not really. It wasn’t minuted, that’s the – that was the difference I suppose, yes, but apart from that, no, there was really no difference.

*Looking back over your whole career do you see any particular highlights or projects that you’re happy with above others?*
No, I don’t – they were all so different, er, and they all contained their good things and their bad things but, no, nothing does. No, just the whole thing was a wonderful experience, for which I’m deeply grateful.

*Were there any projects you remember as being particularly interesting?*

Well, when we started hovercraft of course that was totally new. Erm, and we were eased into the rocket business, erm, we – but even – we made large lumps of all sorts of aeroplanes and even that had its real interest and new people and seeing how other companies worked and so on, so it all had its own little or big, erm, interest that was a change and it was going on all the time.

*Looking back over your whole career again, what sort of changes – what are the most dramatic changes you think you’ve seen in the way that aeronautical engineering is done?*

Oh, I think the government is to blame to a fairly large extent for allowing the aircraft industry to reach the level it has now where, erm, we’re involved in pieces of – and most of the aircraft industry is involved in bits, the biggest bit is a wing, but we – we have no major aeroplane projects in this country now that are controlled in Britain and I genuinely put down – that down to failure of the government to encourage, erm, purchases of military and civil projects. We’re too happy to buy abroad.

*Would you highlight any particular –?*

And that applies to the shipbuilding industry as well, they’ve let most of that go. We had the replacement for the *Queen Mary* built in France? I mean how stupid, I mean it’s just beyond belief that it’s – and here we had all the experience of building big aeroplanes like the Princess and where is the core of the 380 – 800 seat civil aircraft, where is that core? In France. So what did we do wrong? I’m not quite sure but somehow the government should have been encouraging it.

*Are there any particular bad government decisions you’d highlight as being –?*
Well, of course the – the cancellation of fighter aircraft by Duncan Sandys. That showed how stupid, er, a decision you can make without enough thought, that one stands right out. And here we are now, the main project, military aircraft project really, is the Typhoon which is essentially a fighter aircraft developed to do other things as well.

Looking at decisions like the 1957 cancellations, do you think there’s a role for scientists and engineers advising government on these sorts of topics?

Oh, yes definitely, no question about that at all.

Do you think it’s something that government hasn’t taken on board seriously enough?

Yes, I do, very much so. They have enough quangoes without – and yet not that one and that’s a major part of industry in this country, engineering I mean in general. And there should be a strong committee formed, formed committee or whatever, a lot of people don’t like the word committee but for want of another word there should be one on engineering.

Giving what sort of advice, just as an overall direction?

Well, the main thing would be keeping an eye on companies and encouraging companies with not just financial assistance but help to find financial assistance, put the pressure on the banks for that sort of thing. And that isn’t done, and it should be. I mean you hear of that – nowadays that the banks are not lending enough money for industry, well, they damn well should be and they should be encouraged by the government with a big thumb down on them [laughs].

[20:50]

Aside from the role of government over your career, have you seen any sort of changes in the way that the engineering profession is actually carried out?
Well, financial restrictions dominate too much. Erm, they didn’t but nowadays they do and you – you don’t find so much these days that the – that the top man, the chief executive or whoever, is a qualified engineer rather than a qualified accountant, er, and they should sit side by side. I’m not saying that you have two managing directors, that wouldn’t work, but they should be very close to one another, more close than they are.

*From someone who spent forty-six years –*

Yes.

*In the same company I’m thinking, you know, just looking within Saunders-Roe and the things it became afterwards, how do you think it changed?*

Surprisingly it didn’t change very much, mainly because it was all the same people. You had a different name and you – a different responsibility for the – for the top part of the organisation, which would be at Yeovil for instance instead of here at Cowes, you were still – I can’t think of a different word than subservient but that’s too strong a word, much too strong a word. But somehow that was all a bit restrictive. Don’t get me wrong, they helped financially fund some important projects, so we didn’t do badly out of the Westland group but nevertheless there was that feeling that you – you’ve got somebody who’s – who’s up there looking down on you [laughs].

*Looking over your own career as well, do you have any regrets at all?*

No, I don’t think so. Erm, I sometimes think I might have enjoyed just as much had I had that service cadetship when I was eighteen. I think I would have enjoyed working in the services, particularly the navy, I’m sure I would. Erm, but when I say it’s – I have a regret it’s a very passing regret, it sort of comes into my head not frequently at all but every now and then, every couple of years or something like that, I think oh, I wonder what that would have been like. But it’s not – it’s not something that bothers me at all, I have no regrets about that. Erm, I wonder whether I should have accepted that project engineer’s job in the EH101 but even that, you know, that would have been a heck of a lot of travelling about, erm, without the nice bit of having control
over the engineering itself. That was never offered and they backed off about that in
the sense that they didn’t answer my questions.

[25:15]

Looking back over all the different jobs you’ve done, what do you think made them
interesting to you?

Well, there was always something different and we were always progressing into new
things. That was very attractive to me. It was a constant thing, everything we tackled
was a development of having new – new aspects to it.

Were there any big challenges along the way that you remember in particular?

… Well, I suppose the biggest challenge was the SRN4 because that was a really …
different concept and it was – it involved a huge amount of engineering development.
The propulsion systems, the cont – especially the control of the craft but more than
anything the reliability. You had the worst environment you could think of. I mean
they were spraying salt all over the – all over the machine, so you had corrosion
problems that you had to solve, you had vibration problems all over the place. Er, and
then you – it was a new environment to be operating over waves. I mean that; over
waves. Erm, nobody had done that before.

Were there any other particular changes on the SRN4 that appealed to you?

Well, the – the fact that the craft was amphibious and could be operated out – just
outside of a major port rather than right in the port although, as I’ve already said,
British Rail hovercraft did operate within the – within Dover harbour. And one
accident which caused the loss of four lives was as a result of operating through the
narrow entrance into Dover harbour in bad weather, it was put down to pilot error but
I think that was harsh. But in the main the fact that you operated in a new
environment outside the major ports was a very attractive thing. It’s surprising, the
places that could be found to do it and that involved talking to all sorts of people,
town councillors and lord knows who [laughs].
Do you think there are any particular skills that someone in your position needed?
Let’s look over your whole career at different times as well.

Sorry, ask the question again.

Looking over your whole career from working as a stress man to eventually ending up as technical director, what sort of particular skills do you think you needed along the way?

Well, when you were brought up as an apprentice and at university at the same time something happened inside your brain. You – you amalgamated within your brain a way of looking at things and an instinctive built in understanding of the whole subject, so you didn’t – you didn’t have to always think, it was in there in you already because of the way you’d been brought up. Erm, I sometimes wonder if I spent too much time at university and could have done with a bit less but I haven’t any regrets about that. The thing is that once you become chief designer it’s all gone, all that – all that studying you did, although it’s again built something into you, a level of understanding of things, all the detail is just no longer used and that seems an awful pity [laughs].

You used an interesting phrase a second ago that was a particular way of looking at things. I’m not an engineer so I’m not going to share this way of looking at problems but could you characterise it for me a little bit?

Erm, it’s – that’s a very difficult question. Er … you – you’re tackling a concept that, er, you’re going to – you’re going to build something, and already built into you is the knowledge of how you could build that thing. You don’t have to think about it, it’s there in you, you’ve been educated in all the various ways that – to understand how that thing can be built. And it’s a strange thing that – erm, and I often wonder to take a step further with that, that we engineers never thought we were going to fail, we never fail we couldn’t do it, even if it was something completely new like – like
hovercraft. Erm, we didn’t think we couldn’t do it, it never occurred to us, and that’s what’s built into you, you can – you know you can do it, then you just get on and do it [laughs]. Sorry, that’s an abstruse question you just asked.

*It was a pretty good answer for an abstruse question actually [laughs]. One last question on this sort of line, I was just wondering what do you think makes a good engineer?*

Er, well, a very simple answer to that is one who thinks about the job from one end to another for – I mean you – it’s – the easiest part for an engineer is to design a thing that will work, then you’ve got to consider things like safety. I mean, erm, on the N4 as a typical example, how – how have you designed the craft so the passengers can get out quickly in the event of some sort of disaster. If the engine catches on fire how – how well have you confined that? How quickly can you put it out? All those sort of questions have to come in as part of the design, and we were good at that at Saunders-Roe, we really were good at that. And, you know, to me all this new hooah about health and safety is part of any engineer’s philosophy, you didn’t have to have some authority to come along and hammer you, you did it.

[34:40]

*How did you feel when you retired?*

Actually, erm, because I knew things I was going to do and I was very healthy … I was upset at sort of half leaving my colleagues but I knew they all lived around me, hmmm, what I didn’t – didn’t realise was that so many of them were going to die. Because I was promoted comparatively young all my senior engineers immediately below me were older than me, some a generation older than me, and the same thing above me that the people above me were all older than me. And so most of my close friends have – have left, I didn’t know that was going to happen. Well, I did know of course but I didn’t think about it at all that but, erm, that would have happened anyway, but by and large I’ve met new people and involved – the old things I’m still involved in are now run by new people and life goes on, you just have to accept it. But I – I didn’t realise that it was going to be like it is but I’ve completely accepted it,
I mean you – you have no choice in the matter do you? But, no, I realised that – that the firm can manage without me and that I was leaving a good company but I can’t – can’t think of anything more to say about it. It’s just acceptable, er, and the way that I left, erm, was such a happy occasion, it was made a happy occasion by my colleagues.

*How?*

Well, just by the way they treated me, you know, and it – it wasn’t so much goodbye because we were all so local and I was always welcomed back, still am. Some twenty years later I’m still welcomed back.

[37:50]

*So that was 1991* –

Yes.

*What have you done since?*

Erm, well, I’ve been on these various bodies that I’ve described. I’m still well involved in the young enterprise, the Isle of Wight hockey club. I played hockey until I was seventy-four, erm, I still play the odd game of cricket, in fact I played this year [laughs]. And the RNLI, I’m deeply involved in that, and one of the things we’ve – I’ve been deeply involved in, and I still am, is we formed an East Cowes heritage to put together all the history of East Cowes. Now how are we – [pause in recording].

*Talking about history I think before the pause* –

Yes, we were. And what I was going to go on and say that I’ve been interested in the history almost all my life. One of the things I did, erm, when I was at college and serving my apprenticeship, I did a postal course on the early history of man and that was very, very interesting. And so I – and having been involved with this one company all my life and realised how much was owed to Sam Saunders, who was born in the mid-Victorian times and set up a company on the Thames and eventually
moved to Cowes, and I thought this was a very interesting story. So I had done one book on the history of – of the company whilst I was there in the last few years with a friend from British Aerospace.

Who was that?

Burt Tagg, another engineer [laughs], and enjoyed doing that but we concentrated on the aircraft side and there was so much more, especially on the boating side, that I decided that I’d set to work on the rest of the company and put together another book that dealt with everything. Erm, and that was very difficult because, I think I’ve mentioned it somewhere, that in the Cowes raids in 1942 the ship – the shipyard side of Saunders-Roe was completely bombed out of existence together with all its records, so I had to go through old magazines like *Motorboat* and find the Saunders-Roe story from that. I also – well, we, Jean and I, went to Streetly-on-Thames and stayed in the inn where Sam was born and investigated his local history there. And across the river he also – at Goring he also had, erm, boatyards built and the Goring Historical Society, I think it was called, helped me. That was in the late ‘80s that we started it but then I – as I say, I picked it up again and did another big book and then another small book, and then another one, so I did four, and now I’ve just completed my own autobiography. By a strange coincidence this week I’ve been sent a whole pile of material from the Goring Historical Society and they want to talk to me and they want me to come up there and go for trips on Consuta, the – the boat that Sam built of Consuta Construction, sewn together construction, so here we go on another episode of my life [laughs] starting this very week.

[43:20]

But also one day somewhere around 1970, I can’t remember exactly when, there was an advert in the paper that would anybody interested in helping to dig a Roman villa on the Downs report on Saturday. So the whole family went, and my brother was visiting us with his family and we all went, and I thoroughly enjoyed that and met the – the member of the Isle of Wight Historical and Archaeological Society who ran the archaeological section, a chap called Laurie Fennely, and we got very friendly and most of the people gradually disappeared until it was just left with Laurie and me, and
we went on for another sixteen years or so, seventeen all together, until we’d completely undug, as one young lady I heard say who was watching, the villa. And we were told by, erm, the historical – the main historical society, that we must now either cover it up or put a building over it. Well, the farmer who owned the site obviously couldn’t afford to put a building over it, so we watched in about an hour all our work covered up again. But in the course of this digging another avenue of my life opened up because I was very interested in all this pottery we kept digging up and where was it made occurred to me as an engineer, you know, it didn’t just appear with the – compared with today the lack of communication around the place, how did it – what happened? Well, so I got some clay from the site and, erm, made a copy of a pot that I had dug up in bits which we stuck together and, er, that was quite interesting. And I actually made, and I’ve got upstairs, pots of – cooking pots made from clay on the site and it was quite interesting to go through the procedure of making the clay suitable to fire, and I found that it was much better if I cooked up a lot of clay and smashed it up into fine powder and mixed some of it with the clay before it was backed, which was quite interesting. Anyway, I then had got interested in pottery so I went on pottery courses at the college. Jean and I went to a village up country, erm, what’s the name of that wholly owned village? Er, wholly owned by National Trust I think, yes. Erm, it begins with L I think.

[47:50]

Anyway, we did a pottery course there as well, Jean made some very nice things, and – but then decorating the pot led me to get an interest in painting which, by the time I retired, Jean says I want to expand my painting and gave me all her paints and brushes and said get on with watercolour painting, which I’ve done. And I’ve probably done around 100, erm, watercolour paintings and that’s – so that’s also kept me quiet during retirement.

*Any particular subjects?*

Mainly landscapes. I did – I dabbled with drawing faces and people once or twice but that didn’t – apart from the fact I wasn’t all that good at it, I wasn’t bad, it didn’t
attract me at all and so it’s mainly landscapes and buildings and that sort of thing, so far. How it will develop now I’ve got rid of my autobiography and so I’ve more time.

These activities seem quite different to engineering, it’s –

Yes, yes.

What’s the attraction of history?

Well, that was one thing – it’s surprising what comes. When we were digging this Roman villa we couldn’t find where they got their water from and so we got – invited a dowser to come and look for it, and he couldn’t find anything either. But this got me intrigued – if there was ever a person who thought it was a load of rubbish it was me, but surprise, surprise I could do it, and did do it. And what I was good at was tracing the walls of the courtyard by dowsing, the change in the structure immediately under the – I found if people hid a coin I could find it.

How?

I still am amazed, I still hardly believe it but I could do it, and I could do it very easily and to his intense annoyance Laurie couldn’t. So there’s another thing about us humans that [laughs] –

How does it work exactly?

I don’t know, I wish I did [laughs].

What do you actually use?

Well, what I used was, erm, something like eight gauge fencing wire bent to an angle and about that long [demonstrates], er, horizontally and about that, and you must hold it lightly in your hands and you – you’ve got to balance it. And then when you cross something different the wires go like that [demonstrates]. I’m sure Laurie held it too tightly and couldn’t balance it. Anyway, I could do it and did, and I’m still amazed
[laughs]. So there you are, that’s – as you can see, I’ve had a very enjoyable retirement [laughs] and still am.

[51:30]

Then of course there’s been the family and visiting our children and grandchildren and having them here, and you can imagine that visiting grandchildren here on the island is a very enjoyable experience. And we have five, but no great grandchildren yet.

You mentioned along the way that photography was one of your hobbies as well.

Well, we – we had that interest in the sixth form at school and, erm, I’ve taken photographs all over the world and I’ve won cups, sorry, not cups, a cup. I don’t do so much of it now, erm, I take photographs mainly now to help me to finish off my paintings so that I’ve got the view on record of – which I’m painting and you – the paintings I do, like that one there –

One of the boats.

You can’t, erm – well, I didn’t paint that in there at all of course but you can imagine if you’re painting something like that you’re never going to finish that in a couple of hours or something, so what I’ve been doing with photography is painting that – taking a picture of that view so that I can go on painting it here at home. Do you want to look at it? See that’s quite – it’s quite complex isn’t it?

Different shapes, different angles and –

Yes, that’s right.

What’s the attraction of painting?

Achieving a result that pleases you and pleases others.
How different is that from engineering?

Absolutely totally different because it’s a skill of appreciating colour, how you get the colour, erm, appreciating shapes and, er, conceiving an actual picture in your head from what you can see. It’s totally different.

Have you won many awards for your other work along the way?

Erm, no, not really. The main thing that I’ve won that really took the wind out of my sails and really made me feel proud of myself for once – I’m not a person who thinks about myself much and I’ve been very lucky and, touch wood, and not been very ill, I haven’t had my body to worry about. But, erm, I’ve lost my track. What did you ask me to –?

Awards.

Oh, awards. Yes, I was suddenly invited by – the Royal Society of Arts, Commerce and Manufacturing to give it its full name, known mostly as the Royal Society of Arts, awards a diploma which they call, erm, a Royal Designer for Industry, RDI. And they never allow the membership to be more than a hundred in the whole country and you are not allowed to apply for it. If you apply for it you won’t get it, it has to be created from within. And there’s only been one other person on the Isle of Wight who’s been awarded it and that was Uffa Fox who was another friend of mine, he went to school with my mother and got to know him that – through that connection.

Who was Uffa Fox?

Who was Uffa Fox? The famous designer of boats, er, yachts, the sailing boats. You shouldn’t say things like that, you know, you should be ashamed of yourself. Anyway, he’s a very well known character, certainly in the sailing circles, and he’s the only other RDI on the Isle of Wight. And that was – I think it was 1995 I was awarded that, and what amused me was they apologised that it was awarded so late in my life, which I thought was a very nice thought that they could have given it me.
before [laughs]. But anyway, that was marvellous. I don’t think I’ve had any other awards as far as I know, I can’t remember any, no.

Did it come out of the blue?

Sorry?

Did it come out of the blue?

Oh, totally, oh yes, yes. I suspect the main instigator was Christopher Cockerell who was also an RDI, erm, but the firm were involved, they told me afterwards they’d been – er, they’d had to give them a model of the SRN4 to look at. A big five foot long model of the SRN went up to London apparently and I didn’t know anything about it [laughs]. But have I had any other awards? I don’t think so. If I had they’ve passed into, or out of, my memory [both laugh]. Oh, well, I suppose, erm would you count an award being invited to the Buckingham Palace garden party? ‘Cause I had that twice; once in beautiful sunshine and once in absolutely deluging rain in which Prince Philip decided that he wouldn’t go out into the garden and the Queen did [laughs] under a huge umbrella. And that – they were exceptional occasions, so I suppose that’s an award.

When were they?

When?

Hmm.

Er, in the mid to late 1980s, when I was at Westland Aerospace.

How does one actually get invited?

I haven’t the faintest idea. I think, erm, what happens is local councils and other bodies can write to the Queen and ask for you to be invited, I think that’s what’s happened. I suspect that the first time that I was awarded – come to think, it was the
late ‘80s, 1980s, I’d been very active in promoting the company in, er, space work with, and working very closely with, the British National Space Centre, BNS, yes, which is a division of DTi. And I think they invited me, I think, I don’t know. And then I think the other one was the local council for all that I was doing at the college and schools in governing bodies. I was thirty years the chairman of the primary school my children went to, which is a bit of an unusual length of time.

[1:00:40]

How did you work with the British National Space Centre?

Oh, er, this was – at the time the man in charge of the British National Space Centre was Roy Gibson and, erm, you had to work quite closely with him, keeping him advised as what you were up to and how you were getting on, and he would help advise you. He was a really good government official, Roy Gibson, er, and he tried very hard to – he was the boss of it, I’ve forgotten his – what their title was exactly. When Margaret Thatcher had said she would triple the investment in space he was in charge and of course he was exceedingly disappointed when Clarke pulled – advised her to pull us out, which she promptly did [laughs] being Maggie.

As someone who, you know, has seen their earlier involvement in space activities cancelled by the government did you think things were going to change when the British National Space Centre came along?

Hmm, yes, I did but straight away they said their funding will have to come out of the DTi budget and I thought, oh, here we go again [laughs].

Why oh?

Well, the DTi is – they do some good things and they do some bad, stupid things ‘cause they don’t take the right advice, but they do a lot of good, I’m not trying to decry them that much. But as far as engineering is concerned they haven’t been as helpful as they could have been.
**How was Roy Gibson to work with?**

Oh, he’s a real – a very pleasant gentleman, very easy to work with, and you could speak completely freely to him, and him back. A very nice guy and very sensible, knew what he was talking about. That was a good period, it’s just a pity it ended. But when I sit back and think about, which I don’t do very often, I – and I hear all these vast quantities of money that the government are spending, and cutting here, there and everywhere and I think that the small amounts that would have been needed to keep British industry at the top of things, it irritates me. I like the French and my daughter lives there, and so I go there quite a bit, I like the French but it irritates me that they – they’ve got aircraft companies producing aeroplanes and ships and we – and they’re beating us to it like – I did have an experience when the French built a big hovercraft and operated across the Channel, it didn’t work. The motion of it was horrible, it was apparently like being in a washing machine but – and I met some of the senior directors of the SEDAM and offered to help, and I met the French transport minister in his office just to talk about it, and in the course of the conversation the phone rang and somebody rang up about something or other, some – getting some industry or something going, and I could hear it and I stood up and said do you want me to leave and, no, no, we didn’t. And I actually heard him say, ‘That’s all right, if you can find somebody that’ll find half the money we’ll supply the other half.’ I actually heard him and that’s his words, I heard him say that, and I thought God if only we could have that in our country. A straight answer from the minister of transport like that, they would find the money. Anyway, that’s how I feel about the French.

[1:06:30]

**What do you think the future holds for the British engineering industry?**

I don’t like the thought about it. How do you think I feel as an engineer who knows this country has got lots of good engineers who can produce things that can not just sell in England and I hear that the most important industry in this country is London city? How do you think I feel about that? And the incredible wages that the top people get there. I mean my top wage was about 60,000 pounds a year, and no bonuses, I didn’t get bonus – well, you – the only bonus we got was a small allocation
of shares, but … dear me. I find it so – it doesn’t seem right to me at all that – that the city can make such vast quantities of money, doing nothing really in the sense of not producing anything that – just money, paper [laughs]. You can imagine how I feel [laughs].

[1:08:10]

I think I’m coming to the end of questions I actually had. I’ve just got a few more on this interview really, and firstly I’m aware that you’ve recently completed your autobiography and I was wondering how you thought this exercise which, you know, is one form of life story has differed from that, if at all.

Not much, not much, no. No, you’ve probed into – you’ve aroused one or two memories that had disappeared that are not in the autobiography, but it’s too late.

How have you actually found the interview itself?

Oh, I’ve enjoyed it, no, I’ve enjoyed it, thank you.

Thank you.

No, no problem at all. I must admit I was apprehensive about how on earth we were going to spend three days, which when you said that to me I thought bloody hell [laughs] what on earth are we going to talk about for three days. But we haven’t had any difficulty have we?

No, no. How did you feel about being asked to be part of this project in particular?

Oh, I was flattered at first of course?

At first?

Well, no, then it became, er … something to look forward to and I have enjoyed it, I make no bones about it at all.
Have you mentioned it to anybody else?

Yes, and oh, you know, they – not too many people but my next door neighbour said, oh, you know, why on earth have they picked you? [Laughs].

Who else have you mentioned it to? If you don’t mind me asking this.

Well, erm, the publisher in passing, I mentioned it to him. Er, my children I told I’d been invited to do this. I assumed it was a bit of an honour, I mean the British Library is a big thing in this country isn’t it? And Jean, you see, it’s her thing, with library work, she’s – she began work in the wonderful library at Southampton University, I don’t know if you know it, the Turner Sims Library, erm, beautiful library. Erm, and she – she went there for – almost from school. She had another job for a little while but when she saw this job she jumped at it and, I suppose rather amusing really, when she – we got engaged, erm, her – the head librarian approached the – my professor of engineering to see if I really was a suitable person for her staff. So there was a sort of official enquiry as to whether I was good enough [laughs].

I’m going to flick the tape off in a second but I was wondering if there was anything you wanted to add or anything you wanted to ask me, it’s –

No, I don’t think so, no. Just thank you for an enjoyable three days, erm –

Oh, thank you.

And I hope you’ll make good use of it [laughs]. No, thank you very much indeed.

And thank you very much indeed Ray, it’s been a pleasure.

[End of Track 13]